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The Maine Forest: Its Future : A Perspective and Plan of the Maine Forest Service

Maine Department of Conservation

Maine Forest Service

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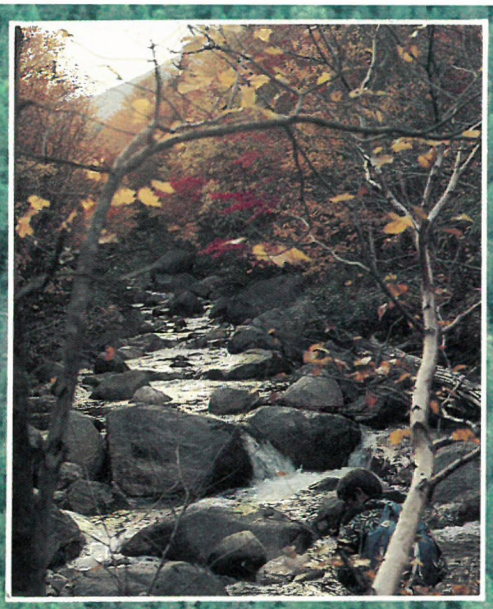

THE MAINE FOREST: ITS FUTURE

A Perspective and Plan of the Maine Forest Service

Maine Forest Service
DEPARTMENT OF CONSERVATION

Richard B. Anderson, Commissioner
Department of Conservation
State House Station #22
Augusta, Maine 04333

Dear Commissioner Anderson:

I congratulate you and the Maine Forest Service for your fine work in producing the Forest Resource Plan of the Maine Forest Service. I know it has been a long process, but one cannot embark on such an undertaking without an understanding of the effort that is involved.

There is more attention being focused on the forests of Maine than ever before. Clearly, all members of the forestry community must devote more time to a consideration of what Maine's future forest is to be. A major portion of the State's economy is based upon the forest. The people of this State not only depend on the resource for their livelihood, but also for their personal enjoyment. Our expansive forestland makes Maine a special place.

Your plan, with its goals and objectives for your forestry programs, is an important beginning in forest resource planning in Maine. I know it is the first time that such a document has been produced, and I hope you and others will continue to build upon this initial work.

Sincerely,

Joseph E Brennan

JOSEPH E. BRENNAN
Governor

Mr. Kenneth G. Stratton
Maine Forest Service
State House Station #22
Augusta, Maine 04333

Dear Ken:

I'm writing to express my appreciation to you and your staff for your efforts in completing the Forest Resource Plan of the Maine Forest Service. I'm really pleased with the plan and regard it as an important document for the Department of Conservation.

I think that the plan will help us and others both in and out of State government to formulate new directions for efforts in forest management and protection. With renewed interest in development of a forest policy, this plan will help focus discussion and enable people to understand the complexity of the issues.

As Commissioner, I expect that we should look to set an examination of our progress towards goals set in the plan, then evaluate and formulate new efforts for State action and involvement in forestry.

Again, congratulations on production of an excellent document.

Sincerely,

Richard B. Anderson

Richard B. Anderson
Commissioner

RBA/epw

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A Perspective and Plan of the Maine Forest Service

Maine Forest Service
DEPARTMENT OF CONSERVATION
1985

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THE MAINE FOREST: ITS FUTURE
A Perspective and Plan of the Maine Forest Service
is dedicated to the Forest
and to the people who care about its future.

Prologue

The Forest is the heart of the State of Maine. In some way, every citizen is touched by it. We constantly demand from it; sometimes the demands conflict. Yet, we can take from the Forest only so much before we must give something back in return.

The quality of the water which flows under and throughout the Forest must be protected and, in some cases, improved. It is essential for our existence.

Soil provides a foundation and nourishment for the Forest. It requires conservation.

Animals rely upon the Forest for food and shelter; but they must share these gifts with humans. Hence, the continuance of many animal species depends upon humans making wise use of the Forest.

Trees add character to the towns and villages which symbolize the Maine way of life. This must be preserved and enhanced.

Products which are indispensible to our quality of life begin in the Forest. Yet, much of the Forest suffers from neglect or overcutting. The principles of sound forest management must be heralded with louder trumpets and more musicians.

The diversity of the Forest needs to be expanded so as to improve its quality and strengthen the State's competitive position in the local, regional, national and global marketplace. As decisions are made to remove trees from the Forest, it is imperative that those decisions be well-planned, with an eye to the Future Forest.

When work is done and we look to the Forest, we need to be assured that we can still find leisure, solitude and an uplifting of spirit.

A resource so valuable must be protected from damages due to wildfire and insects and diseases.

And, most important of all, we must teach the value and essential nature of the Forest to every generation.

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Summary

In the early 1970's, concern over the ability of America's forest to meet demands for its use culminated with the passage of the 1974 federal Forest and Rangeland Renewable Resources Planning Act. The Act called for examination of the forest resources and relationships between social and economic pressures placed upon it. Amendments to the Act brought states into the planning process. Thus Maine became involved in assessing its own forest resource and planning ahead for its management and use.

This plan has been written by the Maine Forest Service, the State's forestry agency. By legislation, the Maine Forest Service was established to "ensure for present and future generations of Maine citizens the greatest economic and social benefits from trees and the forest lands of the State" (**Maine State Government Annual Report**, 1983-84).

Specifically, the Legislature requires the Maine Forest Service to:

- Continue its responsibilities in controlling forest fire, insect and disease destruction;
- Provide advice and assistance on forest management, utilization and marketing of wood products to forest landowners; and
- Undertake information, education, planning, and research efforts.

This plan, then, is a statement of commitment to the Legislature's intent.

The design of the plan is the design of the Forest as it is in Nature, a unified whole. The trees, wildlife, recreational opportunities, soil, watershed and simple food for the soul cannot be separated into neatly boxed categories. What is done in and with the Forest must be accepting of this fundamental principle. The plan then examines these amenities as they relate one to another.

Four chapters comprise the plan, beginning with an historical focus on the human impact upon the forest. The plan relates past attitudes toward, and treatment of the forest to those of current adoption. Chapter One examines what has happened in the past, so a better perspective can be gained of today's forest and its problems. The most significant events or occurrences — the early clearing and settling of land; the rise and fall of the lumber industry; the emergence of the paper industry: the disposal of public lands; the mechanization in the woods and the environmental movement — have transformed a largely virgin forest of pre-European settlement into a forest highly depended upon by Maine's citizens.

Chapter Two is a description of the forest resource as it exists today — the supply and demand for wood products, extent of wildlife habitat, use of the forest for recreation, condition of Maine's watershed, the economic dependence of Maine's people upon the forest and the social significance of the resource. The plan relates how the natural forces of geology, soil, climate, fire, insects and diseases all interplay and affect human action in the forest.

As the discussion in Chapter Two progresses, major needs in the forest which relate to soil and water, fire, insects and diseases, and harvesting and management become evident. The role of the Maine Forest Service relative to these needs is suggested throughout the discussion.

Chapter Three carries further the examination of the Maine Forest Service including its organization and administration.

Action

The most important feature of the plan encompasses several pages in the final chapter. They represent an **Action Plan** — actions the State's forestry agency, both singularly and in cooperation with other entities — is and will be taking to protect and manage the forest.

Problems and challenges revealed in Chapters Two and Three form the framework of the **Action Plan**. The **Action Plan** is designed such that recommended policies and program directions are grouped according to the Maine Forest Service's four basic organizational units. The mission statements and priority program objectives are listed below.

Mission Statement:
FOREST MANAGEMENT & UTILIZATION

In recognition of the status of Maine's important forest resource, conduct a statewide forest management program which promotes and initiates those management practices which will insure a vigorous and productive forest. This program will maintain the integrity of Maine's unique environment while enhancing the economy of the State.

Priority Objectives:

- Increase the acreage of forest land under active forest management.
- Create recognition by the general public and the forestry community (landowners, loggers, foresters, conservation groups and forest industries) of the complexity and interrelationships of the natural resource community.
- Develop tools for landowners to analyze their specific forest land opportunities.
- Strengthen Maine's forest resource-based economy with emphasis on the development of primary and secondary manufacturing capabilities and the marketing of higher value wood products from Maine's forest resource.

Mission Statement:
FOREST FIRE MANAGEMENT

Conduct an effective statewide program of wildfire prevention, detection, presuppression and suppression.

Priority Objectives:

- Review and revise policies of the Maine Forest Service, Division of Forest Fire Control.
- Improve the effectiveness of the Division of Forest Fire Control.
- Increase the awareness of the public and landowners of the need for forest fire prevention.
- Upgrade and expand, if appropriate, training of municipal fire departments; local hot shot crews; industry, railroad, vocational school, and college forest firefighters.

Mission Statement:
FOREST INSECT & DISEASE MANAGEMENT

Evaluate the real and potential impact of forest insects and diseases. Conduct actions to provide pertinent data and/or control of the problems.

Priority Objectives:

- Sustain, improve and expand the forest insect and disease survey and detection role of the Entomology Division.
- Develop, supervise, and conduct an integrated approach to minimizing the impact of forest pests on the forest resource of the state.
- Increase public awareness of the impact of insects and diseases on the forest resource.

Mission Statement:
MAINE FOREST SERVICE ADMINISTRATION

Support, coordinate and assist the divisions of the Maine Forest Service in fulfilling their roles to meet the needs in the forest. Promote and secure the policies and programs of the agency. Provide leadership in educating the general public as to the importance of the forest.

Priority Objectives:

- Increase the efficiency and effectiveness of Maine Forest Service Administration.
- Increase the awareness of citizens of Maine and their elected representatives of the role of Maine's forest in maintaining the economic health and environmental amenities of the State.
- Prepare recommendations to the Department of Conservation, Maine Legislature, and the U.S. Forest Service designed to stabilize funding of Maine Forest Service programs.
- Create a management system designed to maximize the capabilities and effectiveness of the Maine Forest Service's human resources.
- Upgrade the ability of the Maine Forest Service to respond to natural disasters.
- Establish a system for defining and communicating research needs in forestry.

The Plan's Intent

The Maine Forest: Its Future, A Perspective and Plan of the Maine Forest Service is not only for the Maine Forest Service but for all Maine people, for in some way all lives are touched by the Forest. In this plan, the Maine Forest Service has sought to examine all sides of forest related issues. The language herein is non-technical.

All of the following pages are the result of the time and interest of many people. The Maine Forest Service has coordinated the effort, but hundreds of individuals have contributed. Participants at public hearings, members of Task Groups, individuals of all forestry interests who were interviewed separately, and many Maine Forest Service personnel have created this plan.

This document has been written not only as a course of action, but in a manner which will answer questions of why specific actions are being taken. What has happened in the past is recognized, accepted, and understood.

With a glimpse of the past, an examination of the present, the Maine Forest Service plan moves to the future.

THE MAINE FOREST. To thousands of species of plants and animals in Maine, it is a place called home. To the canoeist paddling the Allagash, it is a place of serenity and inspiration. To the thousands of Maine citizens directly employed by the woods industry, it is a livelihood. What is this resource we call the Forest? What is its future in the State of Maine?

Introduction

The forest is a peculiar organism of unlimited benevolence that makes no demands for its sustenance and extends generously the products of its life activity; it affords protection to all beings, offering shade even to the axeman who destroys it.

— Gautama Buddha

This forest resource plan has been prepared by the Maine Forest Service to address these questions. By examining issues related to the forest resource, the Maine Forest Service has simultaneously examined the effectiveness of its own programs in meeting the needs of the resource while operating within budgetary restraints.

The Maine Forest Service is a state agency whose primary responsibility is the Forest. The agency is a partner with four other agencies together forming the Department of Conservation. The **Maine Geological Survey** maps, interprets, and disseminates information on the geologic features of the State. The **Land Use Regulation Commission** plans for the proper use of resources and guides land use in the Unorganized Territory. Planning for and management of the State's public land holdings is entrusted to the **Bureau of Public Lands**. The **Bureau of Parks and Recreation** oversees the state's parks and historic sites.

Collectively, the mission of these agencies is to "preserve, protect, and enhance the land resources of the State of Maine; to encourage the wise use of the scenic, mineral and forest resources of the State of Maine and to ensure that the coordinated planning for the future allocation of lands for recreational, forest production, mining and other public and private uses is effectively accomplished; and to provide for the effective management of public lands in the State of Maine" (12 MRSA §5011).

Evolution of a Plan

The plan was initiated in response to the 1974 federal Forest and Rangeland Renewable Resources Planning Act, as amended by the 1976 National Forest Management Act. The plan examines the effectiveness of Maine Forest Service programs, provides direction for vital traditional programs and suggests designs for new programs which address contemporary needs. The plan has been designed as a five-year plan; it lends itself to modification as new data and information become available.

Work on the forest resource plan began in late 1977. From December 1977, to February 1979, issues relating to various aspects of the forest resource were identified and studied by the Maine Forest Service Planning Division. A series of seven public meetings were held throughout the State, at which the public offered information, suggestions, and criticisms. Much public input is incorporated in this plan.

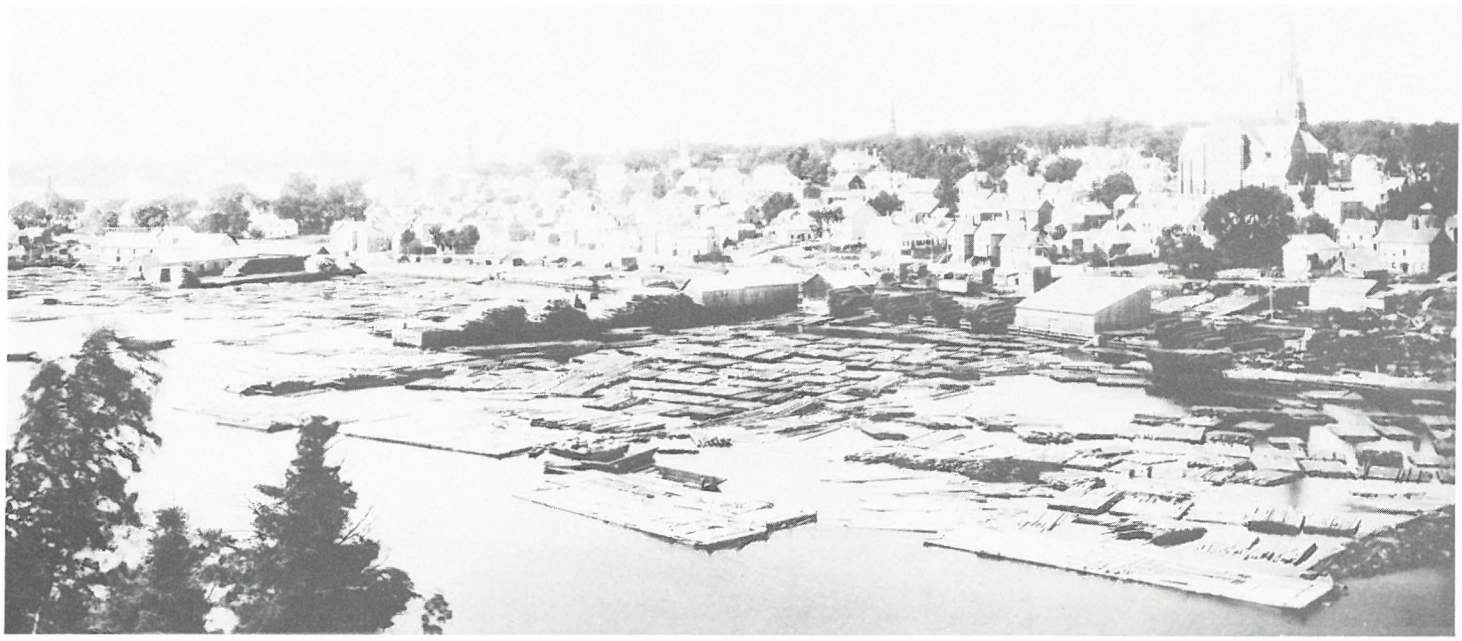
Subsequently in 1978, the State Forest Planning Committee was established to guide the planning process. Representatives from forest industries, woods labor organizations, landowners, state and federal natural resource agencies, educational and research institutions, and environmental groups shared ideas. The Committee reviewed the planning process and periodic reports. They made recommendations to the State Forester on funding, planning, and policy priorities. A list of members is represented in Appendix A.

Thereafter, eleven Task Groups were organized, comprised of representatives from all facets of the forest community. Participants are listed in Appendix B. They evaluated issues and recommended actions. Meeting throughout 1979, and again in 1981, the Task Groups explored the areas of education, research, wildlife, recreation, watershed management, timber, inventory and data management, fire control, insects and diseases, changing forest land use, and forest economics. Issues and recommendations of the Task Groups can be found in "Planning for the Forest Resource: Technical Planning Document No. 2".

With support from Maine Forest Service staff, the Planning Division then reviewed all issues and recommendations and related them to the capabilities and responsibilities of the Maine Forest Service. Thirteen modified issue areas evolved from those originally defined by the Task Groups:

Education
Community Forestry
Forest Economics
Timber Management & Wildlife
Soils
Insect & Disease Management
Fire Management
Administration
Recreation
Planning, Inventory & Data Management
Research
Watershed Management
Marketing and Utilization

Much of the work of the Task Groups is embodied in this resource plan, especially in Chapter Four — **Action Plan** of the Maine Forest Service. Throughout the planning process, the Planning Division interviewed many members of the forestry, governmental, environmental, and university communities. The final product reflects the efforts of many individuals all of whom share a common interest in the forest and a desire to ensure its wholesome perpetuation.



BANGOR HARBOR — Courtesy of 150 years of Bangor Corporation — Mildred Thayer Collection

CHAPTER ONE

History of Maine's Forest

This Chapter describes the forest of time past. What were significant events and occurrences? How have people's attitudes changed? What happened through the years to bring about the forest of today?

Strange that so few ever come to the woods to see how the pine lives and grows and spires, lifting its evergreen arms to the light.

— Henry David Thoreau
***The Maine Woods*, 1864**

Almost four hundred years ago, Europeans left their homeland for a country which offered the hope of renewed spirit. They boldly sailed westward to the shores of a land largely unsettled. They found Americans, native to the land, who belonged to the Algonquin Nation. The two tribes of the Nation, Abenaki and Etchemin, had for centuries asked of the land only the bare necessities. Food, clothing, shelter, weapons, and fire were all obtained from the forest. The tribes made full use of all they took from the forest. When, for example, a deer was killed, its hide was used for clothing, snowshoes and moccasins; its sinew for fish nets; its bones for fishhooks; and its meat for sustenance.

Unlike the Algonquins who moved with the seasons, the adventurers from Europe founded settlements and asked considerably more of the land. Settlements spread from the original Plymouth Colony and then in ever broadening circles to the north, south and west. Explorers and trappers coming to Maine discovered virgin forests dense with softwoods and northern hardwoods. Tall timber trees, especially pine and spruce, predominated with young shrubs and seedlings interspersed. Beech, yellow birch, maples and oaks were probably the most prevalent hardwoods.

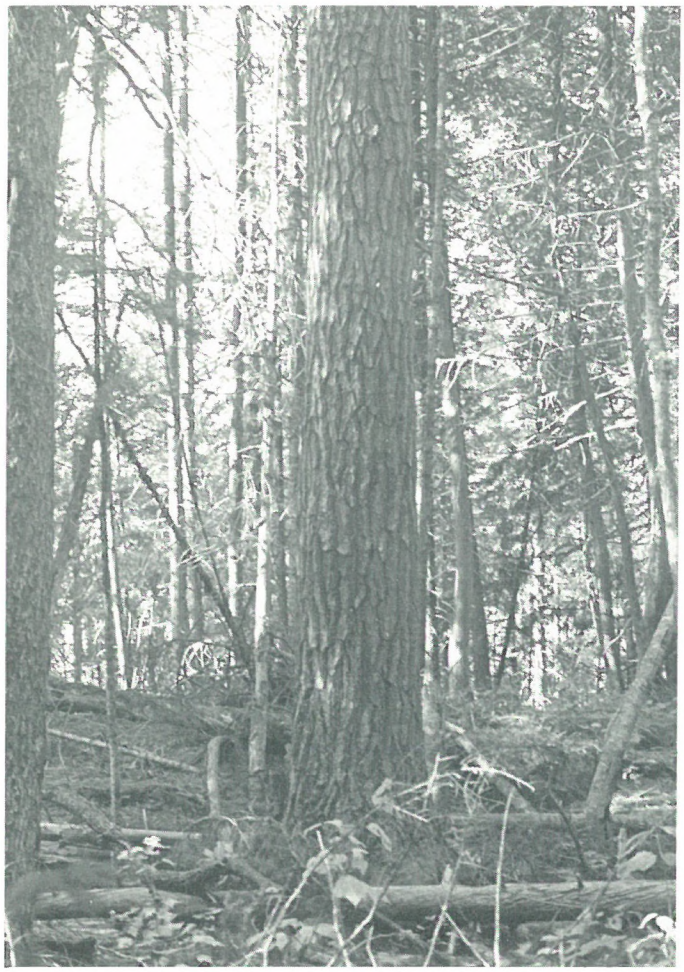
Following closely behind those adventurous souls were the colonists, whose confidence had grown from successes in settlements further south. Enthusiasm for a growing country brought these pioneers to Maine to tame and settle the land, opening vast opportunities for a new nation. But before there could be settlements, before there could be agricultural lands with rows of vegetables and grains, the trees had to be felled. "Let daylight into the swamp; clear the land!" resounded throughout the province. Clearing the land simultaneously provided building materials and fuel for homes and businesses.

Lumbering

During the early seventeenth century, settlement increased in Maine generally following the river valleys. To these early settlers the forest appeared infinite; the forest would last forever and stretched to the North Pole. The British laid claim to the best pines; tall and straight, these trees were valued highly for masts for the King's navy. The colonists watched with dismay as the best pines were marked with the King's arrow for felling.

To provide for building materials for homes, boats, businesses and furniture, a waterpowered sawmill was erected in 1634 in South Berwick. As demand grew more sawmills were erected along the rivers, where the force of moving water could be harnessed to drive the mills and transport logs. When the local timber supply was depleted, the mill site was abandoned, and another mill constructed at the next supply of timber.

The explorers and trappers claimed parcels of land through squatters' rights. Some settlers secured deeds from Indian tribes, but the majority of land belonging to settlers was granted to them by charter from the King of England. Since measurements were often established according to the course of rivers or following the coast, boundaries were crudely delineated.



The land was cleared with a frenzy; some wood was used for products, some for fuel and some was just burned. New uses for wood — oak and pine for building ships, hemlock bark for tanning, and oak for barrels and casks — only whetted the voracious appetite for more wood. The British continued to look across the ocean for their wood products. Potash used in the thriving glass and textile industries was obtained by leaching wood ashes, evaporating the resulting lye and heating the residue until it became a powder. And so, not only was there clearing of the land, but the by-products of burning the chopped trees became a source of income to the colonists. In those days, the value of the ashes as fertilizer was little recognized. Furthermore, the colonists gave no thought to burning fine quality maple, birch, beech, chestnut, oak, cherry and elm.

The Revolutionary War ended British dominance in the States, and sparked zeal for continued growth. Forested land continued to hinder this growth; thus, forests were deemed of little value to the newly formed government. The public domain land, now belonging to the Commonwealth of Massachusetts, was disposed of through gifts to colleges, academies, and to war veterans. Some deeds were awarded in lotteries, and some were sold for pittance. Forested land became a medium of exchange for the fledgling government to pay its war debts and operating expenses and make improvements.

Towns revered the men who built new sawmills, thereby accelerating the clear-cutting of the land; many acres of timber were given to these sawmill owners as a token of appreciation. Farsighted speculators saw wealth in the forests and aggressively purchased available acres. Occasionally, huge tracts of land were purchased by businessmen such as William Bingham of Pennsylvania, who eventually invested in more than two million acres.

As interest in the land developed, more exact measurements were taken using magnetic (compass) north and later true north-south. Townships of six miles square were laid out with acreage within each designated as public lots for ministry, education and future governmental use. Maine gained statehood in 1820, and continued the land policies of Massachusetts.

As the pines began to diminish, lumbermen pushed further and further into the unsettled territory for their source of timber. As the cutting moved inland along watersheds, dams were built to provide sufficient waterflow to float logs downstream to the major rivers.

Boom Times

Lumbermen not only cut and haul from clumps and communities, but reconnoiter the forest, hill, vale and mountainside for scattering trees; and when they are deemed worth an effort, no location in which they may be found, however wild or daring, can oppose the skill and enterprise of our men.

— John Springer
***Forest Life and Forest Trees,* 1851.**

Often clad in red flannel shirts, lumbermen felled trees at a furious pace. As a whole, lumbermen were a boisterous, rowdy group who created legends and then lived up to them. Axes were the tools of men whose competitiveness matched their strength. Horses or oxen pulled the logs to the nearby rivers where they were rolled into huge piles for the winter. When the ice left the rivers in the spring, the logs went in. The lumbermen pushed, rode and followed the logs down the rivers to the mills. The ride was treacherous; caution and quick reflexes were imperative for if the lumberman fell, the force of the water-driven logs could spell disaster. After driving the logs to their destination, many lumbermen returned to their homes and farms; but for others, having worked hard for months in the woods and spent evenings in lumber camps, the rewards of liquor and women were paramount. The mill cities, especially Bangor, provided both.

At the mills, logs which had arrived by river were sawn into lumber. Wooden ships built in Maine transported much of the lumber to the West Indies, where the cargo was exchanged for molasses and rum. Some of the lumber was laid as ties for railroad tracks as they blazed westward. Some was hauled on trains which ran on those same tracks to be used to fence in the western half of a nation. The mid-1800's found Bangor to be the undisputed center of the world lumber trade, a city teeming with prosperity and wealth.

Building of the first railroads into the interior of Maine, beginning in the 1830's, ushered in a new era. No longer were the lumbermen completely dependent upon rivers for transporting logs. Railroad tracks were laid into previously inaccessible and mountainous regions where spruce was the principle softwood.

Courtesy of Maine State Library — Avery Collection

Westward Ho!

Think how stood the white pine tree on the shore of Chesuncook, its branches soughing with the four winds, and every individual needle trembling in the sunlight, — think how it stands with it now, — sold, perchance, for the New England Friction-Match Company.

— Henry David Thoreau
***The Maine Woods*, 1864**

As merchantable pines diminished even further, the newly accessible and plentiful spruce became the preferred sawlogs. The saw accompanied the ax for cutting trees. But word of vast expanses of pines in the Great Lakes States had spread among the Maine lumbermen. As early as the mid-1830's, many lumbermen headed west. Fewer mills were needed in Maine. Those that survived grew as did the extent of their owners' land holdings.

Migration continued into the Pacific Northwest. The lumbermen took their inventiveness with them. Steam power, circular saws — better and faster and more efficient ways to cut trees — were instituted in places other than Maine. Unbeknownst to woodsmen, sawmill owners and citizens alike, Maine's dominance of the lumber industry was beginning to decline.

The tremendously fast growth and unprecedented prosperity of the early 1800's did not last. The Depression of 1873 hit hard; economic gloom prevailed. Farms were abandoned and citizens looked to southern states for employment. Many small woodland owners averted financial disaster by selling to individuals and companies solvent enough to survive ruination.

Meanwhile, the end of the Civil War had marked the beginning of the end for wooden ships. Their destiny was foretold by battles in which iron ships decimated their wooden sisters. Moreover, the large timber companies which were becoming equally large landowners also controlled transportation of the raw material as well as sale of the finished product. When wood was transported by ship, companies used their own vessels rather than relying on the many private vessels which had previously carried their cargoes. More often than not, companies used the railroads. The empire of wooden shipbuilding drew to a close.

With the discovery of gold in California, the emigration of Maine settlers to Western territories was unrestrained. In a final desperate attempt to lure settlers to the north, the State of Maine gave its public domain land, land which belonged to the State but had not been populated, to individuals who were willing to settle, and handed over thousands of acres to the European and North American Railroad with the hope that the development of rail transportation would entice people to Aroostook County. The railroad and the attempt at settlement failed. The last remaining tracts of the public domain were auctioned off primarily to timber companies. After the land auction, the public lots within the townships were all that remained of the State's once extensive holdings. Because they were now surrounded by private land and were virtually inaccessible, the public lots suffered from neglect.

Paper Comes to Maine

The mid-1800's marked a profound change in the woods industry. Since its inception in Europe, the paper industry had relied on rags and straw for its raw material. The discovery was made in 1870 that wood fiber could be used as a substitute for rags. Almost overnight, the developing pulp and paper industry mushroomed in the United States where the supply of raw material was bountiful. Unlike sawmills which followed the timber, pulp and paper mills had timber brought to them and became a competitor of sawmills for the natural resource. Large investments in buildings, equipment, and energy needs, coupled with the need for an abundant, continuous supply of timber dictated permanence to the paper mill locations. Railroads were crucial to this development. By 1880, the pulp and paper industry had become the largest wood-using industry in Maine; ten years later Maine led the nation in pulp production.

Improvements continued to be made in the paper industry. Many mills consolidated, forming such large companies as Great Northern Paper Company and International Paper Company. As the nineteenth century came to an end, hydroelectric power provided energy to drive the mills' machinery. Confrontation between the paper companies upriver and the sawmills downriver ensued. Dams which provided continuous flow for hydropower also hindered log drives. Bitterness raged. In the end, the paper companies won control of the rivers.

The Cry for Conservation

So far as the natural resources were concerned, we were still a nation of pioneers. The world was all before us, and there would always be plenty of everything for everybody. Public opinion held the forests in particular to be inexhaustible and in the way. What to do with the timber? Get rid of it, of course.

—Gifford Pinchot
***Breaking New Ground,* 1947**

By the end of the century, it became apparent that the forest would not last forever. Much of the accessible timber had been either cut or burned. The hardwood forest in the southern part of the State had been cleared or burned; one half of the hemlock in the State had been used in tanning; one third of the cedar had been cut for ties, shingles and poles; much of the spruce went for sawlogs and virtually all the old growth pine was gone. Many stands that remained contained trees of small diameter and poor quality. Land management and forest cutting practices by the woods industry came under attack.

As with many other reform issues of the day, the newspapers delved into the issue of a dwindling forest resource. Conservation of the resource through more complete use of each felled tree and replanting of cleared areas became a conviction. Demand for legislation to require landowners to practice good forest management appeared in major newspapers, especially the Bangor **Daily Commercial** and the Portland **Eastern Argus**. The destruction by insects and diseases were believed by many to be a result of poor management of forests. The incidence of fire, prevalent at the end of the century, created concern and dismay. In response, the legislature created the Maine Forest Commission in 1891, (PL 1891, C. 100 §1), with the mandate to evaluate conditions relating to forestry, the destruction of the forest by fire, and cutting practices.

Foresters Enter the Woods

During this time, the companies began to realize the need for a continuous supply of wood, especially from their own lands. Economics demonstrated that reinvestment in their woodlands would achieve long term production on a sustained yield basis, allowing a consistent level of growth as well as harvest. Some companies saw the value in this approach and experimented with a startling new course to achieve their goal - they hired company foresters. In 1895, Berlin Mills in New Hampshire employed Austin Cary as the first company forester in the country. He had grown up in the Maine woods and had an excellent rapport with those who worked the woods. Hired to map the company's woodlands, a portion of which was in the Rangeley area in western Maine, Cary convinced the company to consider their holdings as a long-term as well as a short-term investment. He preached his revolutionary ideas whenever

he was in contact with other landowners. He advocated leaving small diameter trees for further growth, cutting trees to low stump levels, using more of the tree up into the limbs, and the most radical idea of all, *planting* trees. Great Northern Paper Company became the first Maine mill to accept the methods. However, company foresters as a whole were resented because they were educated and expounded theories of forest management which were totally alien to the lumbermen who had dominated the Maine woods since the 1600's. Lumbermen were experienced in harvesting only, and were not easily convinced of the value of long-term forest management.

A nation utterly absorbed in the present had to be brought to consider the future...put forestry into actual practice in the woods, prove that it could be done by doing it, prove that it was practicable by making it work.

—Gifford Pinchot
***Breaking New Ground,* 1947**

Although many companies continued their controversial forest practices, newspapers would not let up. The conservation ethic grew. Big business, typified by the pulp and paper companies, and its control of government were looked at disdainfully by those who favored conservation. The practice of forestry had spread and was considered a crusade against the destruction of the forest. Nationally, Theodore Roosevelt consolidated administration of the national forest reserves into the newly formed Bureau of Forestry in 1905. Gifford Pinchot, one of the leading conservationists and a devout believer in the principles of forest management, was appointed head of the Bureau.

At about the same time, in 1903, the University of Maine estabished its forestry program. Austin Cary prepared evaluative reports on the forest for the Forest Commission and through his efforts, the State's Forest Commission gained the respect of those affiliated with the Maine woods. In 1913, the State added a forest nursery to the University to encourage tree planting.

The incidence of insect and disease destruction of the forest became more recognized. White pine blister rust and spruce budworm had damaged Maine's most valuable species of trees, white pine and spruce respectively. In 1921, the State's first forest entomologist began tackling the most prevalent insect and disease problems.

But, World War I had erupted and the country was turning its attention away from conservation issues to events across the Atlantic. Meanwhile, the pulp and paper companies met the additional demands of a wartime economy. Increasingly, demand grew, production grew, and the companies' land holdings grew.

The lumbermen, now more commonly known as woodsmen or loggers, had also begun to change. Rather than maintaining camaraderie with fellow loggers in logging camps, they chose to marry, have families and commute to and from work as often as possible. Mills located in the south enticed workers out of the woods. To fill the void, many Canadian workers entered the Maine woods and the rivalry which continues decades later began to grow.

The Forest Commission expanded and became known as the Maine Forest Service. Its fire control efforts improved; airplanes became vital for forest fire observation and detection. Telephone lines for communication extended hundreds of miles. The Legislature delegated to the Forest Service responsibilities relating to the control of insects and diseases. Cooperation between the Forest Service and the landowners began to evolve as landowners provided personnel and finances for insect surveys on their lands and in turn, reported results to the Maine Forest Service. In addition, landowners aided in construction of fire lookout towers, and supplied men and equipment to battle fires.

With the first presentation in 1921 and continuing for three decades after, Governor Percival Baxter gave parcels of forest land totalling over 200,000 acres to the citizens of the State of Maine. Baxter State Park, with the peak of Katahdin as its highlight, "...shall forever be used for public park and recreational purposes, shall forever be left in the natural wild state, shall forever be kept as a sanctuary for wild beasts and birds..." (P & SL 1931, C. 23)

But the 1930's slowed progress as the Great Depression shattered the country. Maine was devastated. Already ailing from declining population, the State suf-

fered massive unemployment. Franklin Roosevelt's New Deal, especially the Civilian Conservation Corps, helped to rescue the State. Under the supervision of the Maine Forest Service, the CCC built roads, forest fire lookout towers, and campgrounds; helped in the control of insects and diseases; removed slash (residue branches, limbs and tops of trees from logging operations); and aided in fire protection.

The Coming of the Machine Age

No sooner had the State begun to recover from the Depression than World War II enveloped the globe. What the woods industry lacked in reduced manpower, they made up for in remarkable advances in the development of mechanical equipment. Many trucks, tractors, bulldozers and power saws entered the woods. Companies constructed miles of roads upon which the new equipment travelled. As in the earlier case of the railroads, companies became less and less dependent upon rivers to transport logs. The illustrious log drives suffered from lack of men to run them. Undeniably, road transport was cheaper, more expeditious, did not require a spring thaw, and did not risk sinking timber to the bottom of rivers.

Wartime prosperity continued after V-Day. Soldiers returned home. The nation soon realized, however, that wartime demand had resulted in severe overcutting of many forests. Sentiment grew for a nationwide forest practices act. As an alternative, the federal government initiated a forestry program in many states to promote selection cutting. In Maine, a program was begun in 1943 known as farm forestry.

Following the war, low interest loans enabled veterans to build houses, pursue educational goals and venture into business. The farm forestry program grew. In his Twenty-Sixth Biennial Report, Maine Forest Commissioner Raymond Rendall noted that "a great deal of time had been spent during the last year with veterans and others who are interested in going into the lumber business...the request for information, to look over timber lots with the idea of setting up a mill, etc., is a new phase of the work that has come in recently."[1] In response, the Legislature in 1949 (12 MRSA, C. 346) established an assistance program within the Maine Forest Service to give technical guidance in forestry to small woodlot owners. The farm forestry program, boosted by State support, became known as the Service Forestry Program.

Bigger, Better, Faster

Development, growth, and progress characterized the era after the war. Greater demand brought greater pressure upon the forest.

Throughout Maine, working conditions improved. As employees were given more leisure time, their interest in recreation grew dramatically. The woods, lakes, and rivers offered the opportunities for which they searched. The concept of multiple-use of the forest resource began to evolve.

The war had stimulated the woods industry. Demand was high and competition from the West and South in lumber, and from Canada and the South in pulp and paper was stiff. Companies concentrated on production, growth and reduced costs of operation. During the war years, the reduction in manpower hampered efforts to remove the residue left from the much expanded harvesting of wood. In addition, a severe hurricane in 1938 downed hundreds of acres of trees. A large amount of salvage was removed, but much had to be left in the woods.

Inadequacies existed in the State's forest fire-fighting capacity; training for control of large fires was deficient; equipment, especially large mechanized equipment, was sorely lacking; and radio communication was incomplete. Within the organized towns, "skimpy, obsolete, often makeshift equipment"[2] was all too commonplace. Although the Maine Forest Service had fire control responsibilities in the Unorganized Territory, there was no centralized network for the entire State. To make matters worse, the late summer of 1947 brought severe drought. In October, blazing fires engulfed thousands of acres in the worst fire disaster the State had ever experienced. The aftermath found sixteen people dead, nine communities in ashes, 2500 citizens homeless, and over 200,000 acres destroyed. As a consequence, the Maine Forest Service began to correct many of the deficiencies which the fires had made apparent. Many more fire towers were built; the radio communication network was greatly expanded and public relations efforts — radio messages, films, literature, and exhibits at fairs and other events aimed at fire prevention — were developed. Smokey Bear, the symbol of fire prevention, became established in Maine. The Legislature also responded by giving the Forest Service responsibility for forest fire suppression throughout the entire State (P.L. 1949 C. 355). Other legislation added Maine to the Northeastern Interstate Forest Fire Protection Compact — a cooperative of northeastern states which provides mutual aid to battle large forest fires.

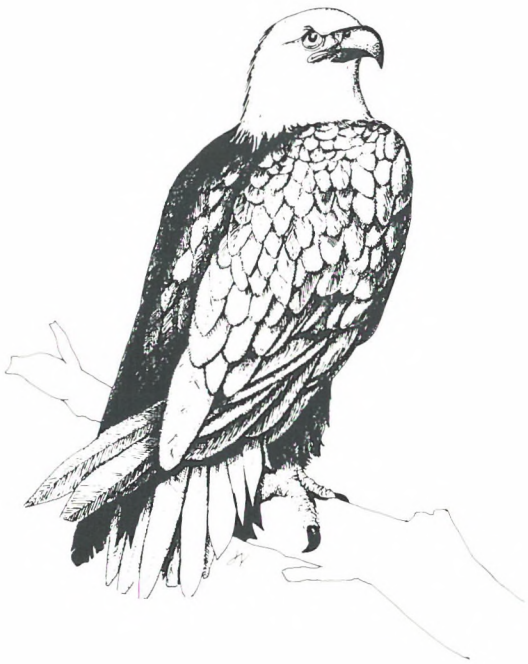
Pesticides were introduced as weapons to wage war on insects and to discourage growth of undesirable species of trees and shrubs. Powerful chemicals were used in agriculture and forestry. Gypsy moth and spruce sawfly epidemics became widespread. Spruce budworm populations increased. The Legislature reacted to pleas for a combative effort by enacting emergency legislation in 1949 (12 MRSA C. 24) calling for aerial spraying against insects or diseases when necessary. The State, under the auspices of the Maine Forest Service, undertook periodic spray programs.

Across the nation, new forests were planted under the Soil Bank program. Concerns over increased soil erosion and an overabundance of some crops led the federal government to take acres of agricultural land out of production. Abandoned farmland was also reforested. The government aided growth of the State

forest nursery to make the effort possible. During the program's existence in Maine, from 1956 to 1960, 17,200 acres were planted with over 17,000,000 trees. Many are now ready for their first thinning.

The 1950's and early 1960's brought continued mechanization into the woods. Chainsaws and rubber-tired skidders, the two now almost universal pieces of equipment used for logging, revolutionized woods operations. Larger and larger pieces of equipment moved the trees faster from the woods to the mills. The accompanying network of hundreds of miles of roads steadily expanded into the unpopulated regions of the State, providing access to remote areas.

Even recreation areas felt the advance of enterprise. The National Park Service began exploring the possibility of creating a national park in the Allagash Waterway. Word leaked out in 1960. As the park study increased in depth, opposition from Maine's citizens also grew. The State grappled with the issue for six years and then finally voted to quash the national park concept and ensure the wilderness qualities of the Waterway at the State level instead. One and one half million dollars were appropriated to protect the Allagash Wilderness Waterway. Maine citizens, increasingly mobile and increasingly knowledgeable, had taken a proprietary interest in the forest.



The Environmental Movement

Ecology has not yet explicitly developed the kind of cohesive, simplifying generalization exemplified by, say, the laws of physics. Nevertheless, there are a number of generalizations that are already evident in what we now know about the ecosphere that can be organized into a kind of informed set of "laws of ecology."

The First Law of Ecology: Everything Is Connected to Everything Else.

The Second Law of Ecology: Everything Must Go Somewhere.

The Third Law of Ecology: Nature Knows Best.

The Fourth Law of Ecology: There is No Such Thing As A Free Lunch.

—Barry Commoner
***The Closing Circle,* 1971**

Unrestrained progress does not proceed without a price. The environmental movement of the 1960's and '70's revealed that the post-war wave of strong economic activity and development had had repercussions. When the State's people looked beyond the bustling mills and factories and into their own back yard, they did not like what they saw. The waters were no longer pure, many animals were in danger, and the land was being abused.

Chemicals, organic compounds and solid matter, by-products from the paper-making process and other industries, and municipal sewage were degrading Maine's waterways. Pollution was destroying fisheries, rendering municipal and private drinking water supplies unconsumable, depreciating river front properties, and interfering with the recreational use of Maine's rivers. Industries and municipalities resisted early State efforts at reducing waste effluent.

Public awareness of the pollution problem turned into anger which turned into action. Armed with the newly enacted National Environmental Policy Act of 1969, and Water Pollution Control Act of 1972 and its amendments, environmentalists and federal and state officials demanded cleanup of the State's rivers.

Pulpwood drives, which had declined considerably as companies favored transporting wood by truck, were blamed for some of the pollution. Materials leached from the bark which the water and rocks peeled away. An estimated four percent of the logs sunk to river bottoms. The presence of bark and logs in the rivers interfered with recreational use, boating and fishing. A report to the Legislature in 1971, recommended phasing out the log drives. Legislation was enacted, and five years later, the last pulpwood made its way down the Kennebec. A renowned era came to a close.

During this period, industries, most notably paper companies, began modernization of their plants, spurred by an unprecedented nationwide economic surge. Refurbishing outdated production methods allowed former wastes to be utilized in the production process rather than to be battled at the end of the process. Thus, through modernization, industry greatly expanded efficiency and reduced production costs. At the same time, many pollution problems were solved. In 1976, Maine was the first state in the country to meet the U.S. Environmental Protection Agency's (EPA) clean up standards. A number of municipalities did not do as well, however. Even today, raw sewage still flows into some of Maine's waterways. Progress in cleaning up the rivers has been slow, and the cost has been high. The process is as yet incomplete, but rivers which were once a dumping ground now have salmon returning to them, are becoming suitable for recreation, and no longer produce putrid odors.

Insecticides posed another environmental problem. Rachel Carson's **Silent Spring**, published in 1962, alleged that insecticides, notably DDT, which agriculture and forestry had trusted to give relief from destructive pests, had placed amphibians, reptiles, fish and birds on the same mortality list as the destructive insect that DDT was designed to eradicate. The University of Maine at Orono and the Department of Inland Fish and Game (now Inland Fisheries and Wildlife) found evidence to support their allegations. DDT was banned in the State in 1967, two years before the federal government's ban.

The booming economy made its impact upon the land as well as the water. Increasing seasonal home construction and proposals for development in the Unorganized Territory alerted Mainers to blight upon the landscape. Concern increased as talk spread of ski resorts; additional development of Bigelow Mountain, one of Maine's most impressive landmarks; and even hosting the Winter Olympics. Visions of substandard development and increased water pollution roused public action. A battle ensued in the Legislature as those who championed the environment contended with those who championed the rights of property owners.

After long debate, the Legislature established the Maine Land Use Regulation Commission (LURC) in 1969 by statute (12 MRSA, C. 206-A) to act as municipal agency for the Unorganized Territory. LURC functions to plan, zone, and enforce land use standards on 10.3 million acres, fifty percent of the State (Figure 1) for "appropriate multiple use of the resources in the wildlands."

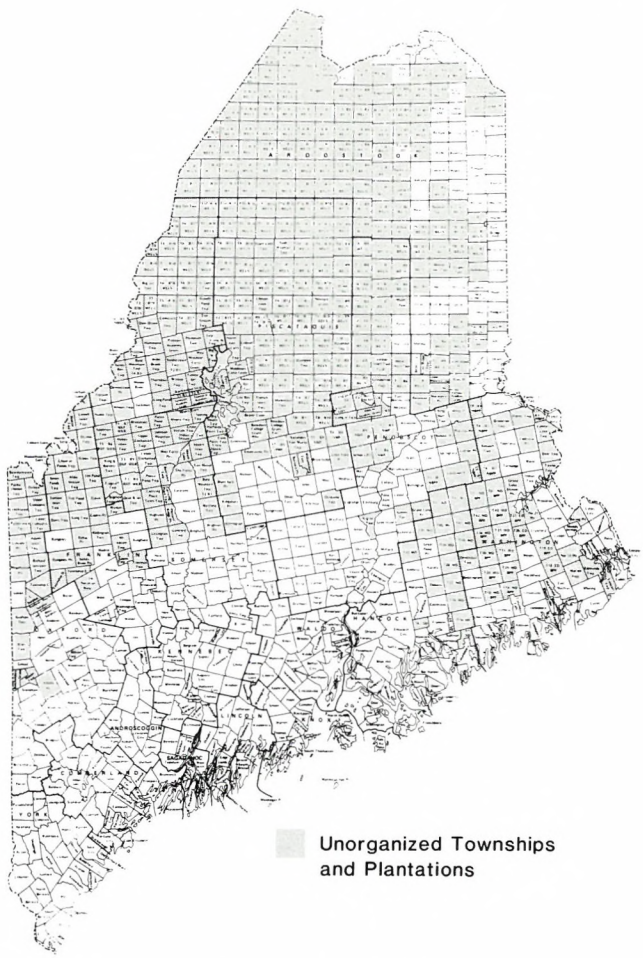
As is evident, many environmental issues surfaced during this time. Sometimes regulation was the means to resolve the issues, other times compromise served the purpose. Throughout the debates and confrontation, Maine citizens realized the importance of their role in protecting what they had begun to consider as *their environment.*

Creation of a Natural Resources Department

In the early 1970's a series of letters to the editor, articles and editorials in the Portland **Press Herald** sparked interest in the State's land holdings, the public lots which had been neglected for a century. Legislation was proposed in 1973 to entrust the State with governance, management, and sale of these public lots. That same year, the court affirmed the legality of the legislation and the Bureau of Public Lands was created. Through a series of land sales and trades, the Bureau began to regain, exercise control over, and consolidate the State's public lands into usable tracts upon which intensive forest management has begun to be practiced.

In the interest of better management and fiscal austerity, a proposal was made to reorganize State agencies including the natural resource agencies. The newly formed Land Use Regulation Commission and the

Figure 1
Land Use Regulation Commission Jurisdiction



SOURCE: Land Use Regulation Commission

Bureau of Public Lands were to be included in one comprehensive agency. Some independent agencies, however, fought hard for autonomy. Consequently, the resulting department, organized in 1973, encompasses only a portion of the natural resource agencies of the State. The Maine Forest Service joined with the Maine Geological Survey and the Bureau of Parks and Recreation as well as the Land Use Regulation Commission and the Bureau of Public Lands to become the Department of Conservation.

Today's Focus

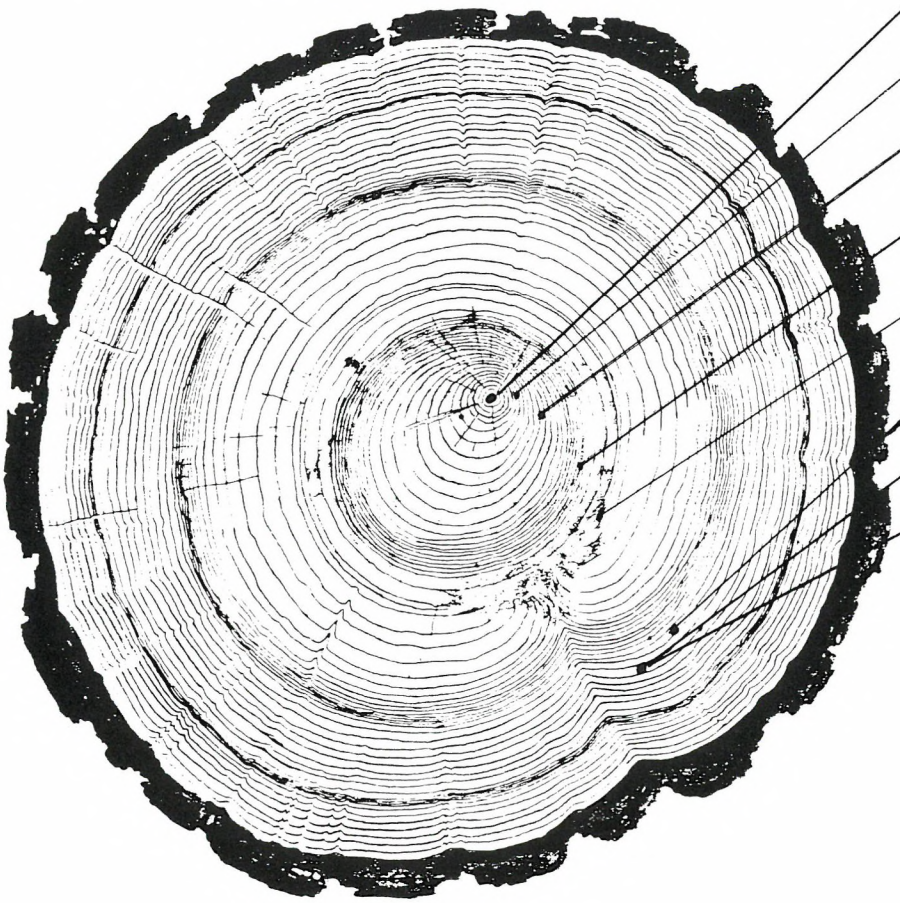
The 1980's find the tenets popularized at the beginning of the twentieth century just as pertinent at the close of the century. Sound forest management techniques produce vigorous forests as well as wise use of the total resource. This fact is the premise upon which all of the Maine Forest Service efforts are based. It will also be the focus for the following sections of the Maine forest resource plan.

Figure 2
Significant Events and Occurrences in Maine Forest History

**THIS SECTION OF A TREE DEPICTS MAINE'S FOREST HISTORY.
SOME DATES MAY REPRESENT APPROXIMATE PERIODS OF TIME, NOT SINGLE YEARS.**

BEFORE THE TREE BEGAN TO GROW:

1670 Clearing and burning of forest land for settlement
1780 State land sold or given away
1830 Lumber industry flourishes
1860 Westward migration
1880 Pulp and paper industry begins
1900 Land conservation movement



1903 University of Maine forestry program begins

1909 Maine Forest Service given control of forest fires

1913 Spruce budworm and gypsy moth outbreak

1925 Maine Forest Service given entomology responsibilities

1930 Mechanization in the woods

1947 Maine Forest Service — Service Forestry Program

1949 Worst fire disaster in Maine's history

1949 Spruce budworm outbreak

AFTER THE TREE WAS CUT:

1970 Environmental movement
1970 Land Use Regulation Commission and Bureau of Public Lands
1973 Maine Tree Growth Tax
1983 Repeal of Maine Foresty District

Sketch adapted from "The Life of the Forest." Used with permission of Champion International Corp.

Footnotes — Chapter One

[1] Rendall, Raymond, **Twenty-Sixth Biennial Report of the Forest Commissioner,** 1945-46, p. 83.

[2] Butler, Joyce, **Wildfire Loose: The Week Maine Burned** (Kennebunkport, Maine, Durrell Publishers, 1978), p. 147.

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CHAPTER TWO
Maine's Forest Today

Many facets comprise the forest of today. Knowledge has been gained. The economy has changed. Pressures and demands have increased. Sometimes conflicts have arisen. The adage "we can't see the forest for the trees" is appropriate. Many decisions regarding the forest have been made with a narrow field of vision. As society has made use of all the forest provides, there has not always been an understanding of the impact decisions have had upon the trees, soil, wildlife and watershed — the ecosystem known as the Forest. In protecting the forest against insects and diseases, environmental consequences have not always been considered.

The reverse of the adage may also be accurate: "We can't see the trees for the forest." Sometimes broad decisions have not taken into consideration, for example, characteristics of particular stands of trees or the specific needs of individual landowners.

It becomes important then, in making decisions, that there be a better understanding of the total forest resource and the forces affecting it. The previous chapter dealt with those forces of history which have created the forest of today. How can we know where we are or where we are going without first understanding where we have been?

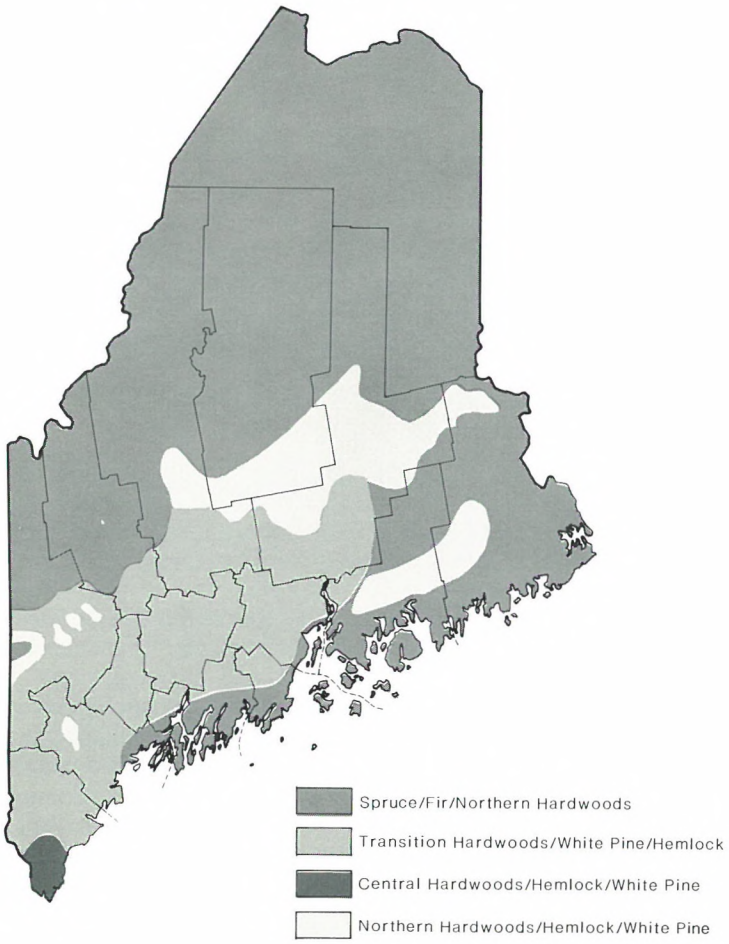
This chapter examines the intricacies of the forest resource as they interweave to form a complex web of life. The natural forces of geology, soil, climate, water, fire, insects and diseases all interplay. To a certain extent, some of these factors can be manipulated; but, to a far greater extent, they place limitations on the uses to which the forest can be put. By understanding these natural forces and how human forces can intervene, the role of the State, especially the Maine Forest Service, becomes clear. Throughout all of its programs, the Maine Forest Service seeks to balance all of the pressures upon the forest for the benefit of the people of the State without compromising the integrity of the forest resource itself.

CHAPTER TWO—Section A

Physical Features Affecting the Forest

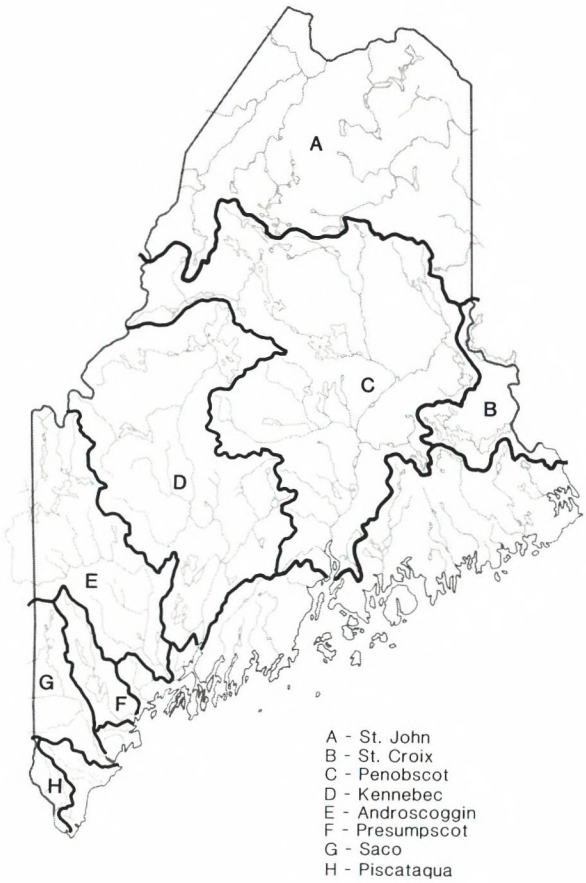
Flying over the State at a height of 15,000 feet, the Maine landscape appears as an endless span of forest interrupted only by the blue of rivers, lakes, streams and ponds; the browns of bogs, marshes and swamps; and the multi-colors of scattered residential, agricultural and industrial activity. From a lower altitude, the 2200 square miles of surface water become more visible. Distinct forest regions can be seen, but patterns change as the regions blend into one another. Figure 3 depicts the major forest vegetation regions: central hardwoods-hemlock-white pine; transition hardwoods-white pine-hemlock; northern hardwoods-hemlock-white pine; and spruce-fir-northern hardwoods.

Figure 3
Natural Forest Vegetation Zones



SOURCE: Society of American Foresters

Figure 4
Major River Basins



SOURCE: Maine State Planning Office

In the southern portion of the State, pines dominate the scene with hemlock and hardwoods, particularly oak, red maple and birch scattered throughout. Sandy, well-drained, deep soils provide good media for growth of these species. The climate is moderated by the ocean and abundantly supplied with rainfall. Such characteristically southern species as hickory and black walnut reach the northeastern limit of their range. Along the coast, soils tend to be shallower and less fertile; the climate, cooler. Spruce and fir compete better than other species under these conditions.

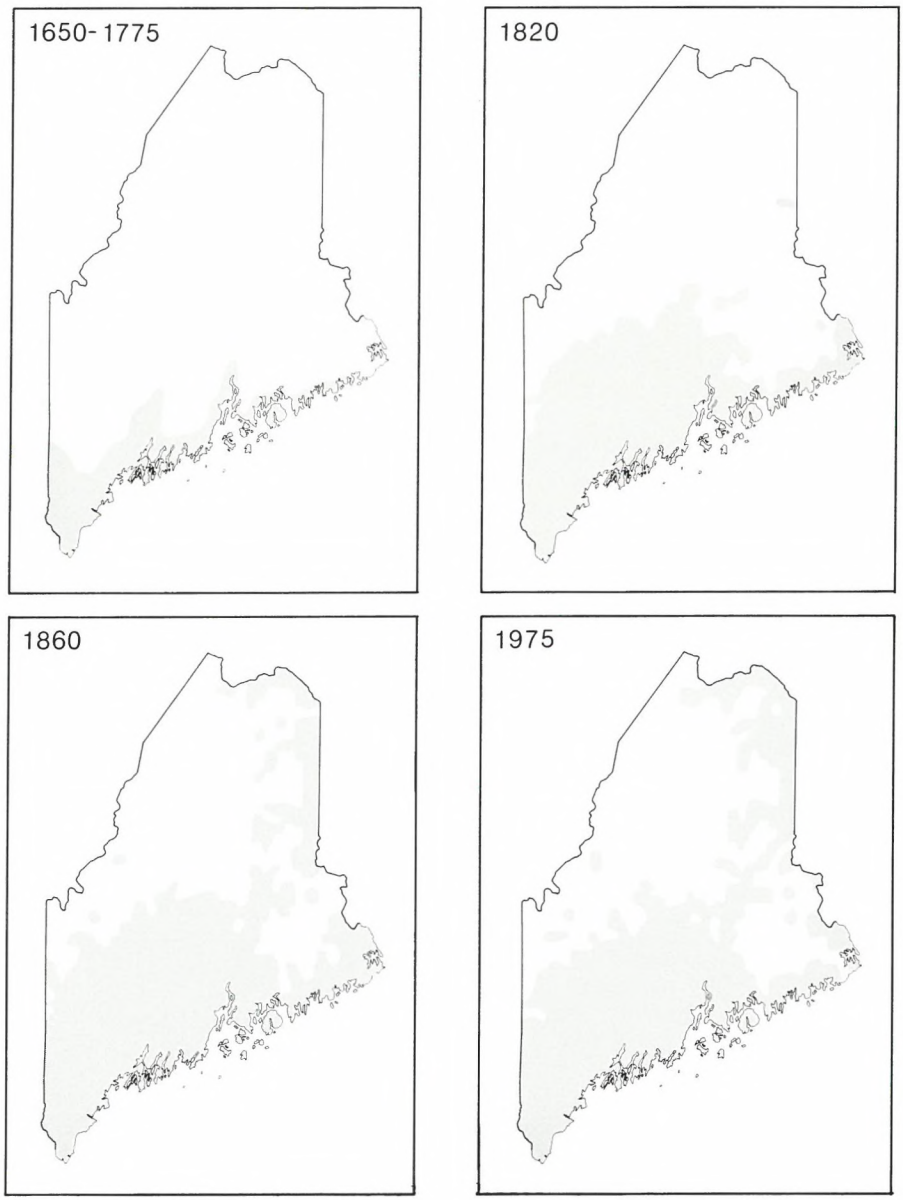
Wildlife is abundant, as food supply is plentiful and diverse, and the winters are milder than in other areas of the State. Since early settlement, people have found this section of Maine attractive, as Figure 4 indicates.

Many hardwoods, especially birch, beech, and maple are found in the western and central portion of the State. A combination of good soils and drainage in upland areas favors these species. As elevation increases in the mountainous area, climate becomes more severe and soils more fragile and thin giving rise to sparser vegeta-

tion. The composition of the forest begins to change to spruce-fir. As Figure 5 shows, headwaters of many of Maine's rivers originate in the mountains of western Maine. Wildlife is plentiful, but in higher altitudes sparser vegetation provides sustenance for fewer animals.

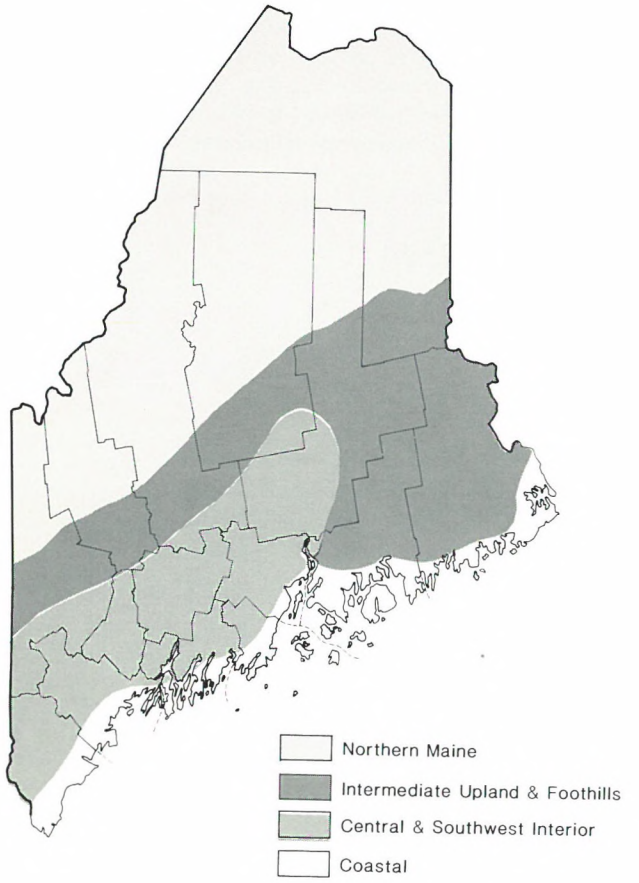
To the north, spruce and fir predominate over approximately 50 percent of the 17.2 million acres classified by the U.S. Forest Service as timberland, land capable of producing wood for industrial use. The northern summers provide adequate rainfall and warm temperatures for the growing season. "Winters are beneficial to timber harvesting because the frozen ground and snowpack makes transport of wood easier."[1] Forest soils tend to be of poorer quality, acidic and shallow. Due to less diversity in vegetation and to the harsher winters, fewer species of wildlife are found in the north than in areas in the southern portion of the State.

Figure 5
Limits of Permanent Settlement, 1650-1975



SOURCE: Maine State Planning Office

Figure 6
Climatic Divisions



SOURCE: Maine Technology Experiment Station

Thus, climatic, topographic, geologic and soil conditions influence species distribution. By examining Figures 6, 7, and 8, a pattern begins to develop, a pattern which coincides with the forest vegetation zones in Figure 3 page 14.

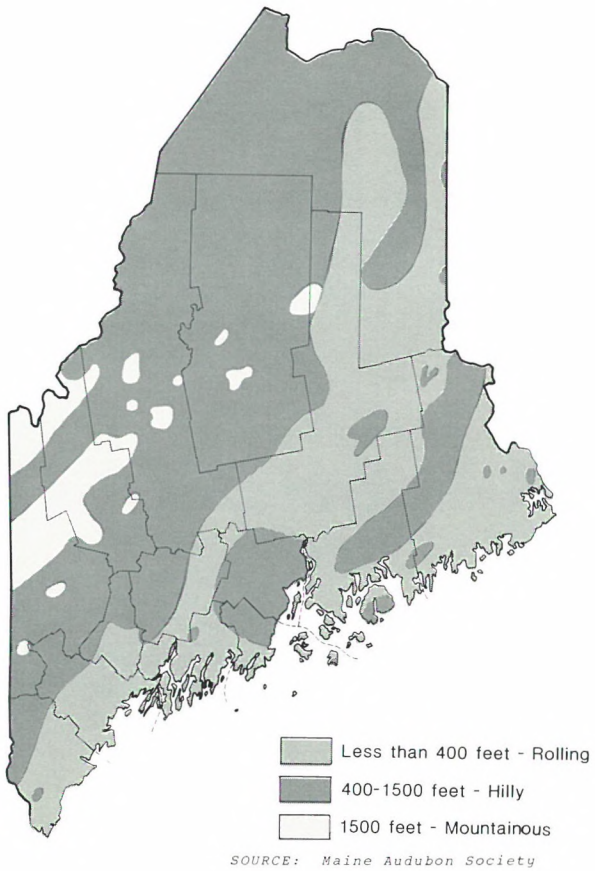
Climate takes into consideration rain and snowfall, storms, flooding, winds and temperature. In Maine, climate is noted for its unpredictability. "If you don't like the weather now, wait a few minutes" is a popular saying with some merit. Vast ranges in temperature, both on a daily and yearly average, differences in weather within given seasons over different years, and diversity in weather from one area to another characterize the State's climate.

Climate, especially precipitation, affects the amounts of surface and ground water. Land forms come into play. For example, mountainous areas generally receive more precipitation than do low-lying areas. In the spring, snow upon the mountains melts causing water runoff. Some is used by plants, some is retained in ponds, lakes and bogs, but the majority finds its way filtering through the soil to the groundwater system and to streams. Here the soil becomes a factor in that particle size and density determine how effectively water filters through the soil or whether the water will be transported carrying soil particles with it. The size of the particles making up the soil range from the very small particles characteristic of clay to the much larger particles attributed to sand.

Geologically, Maine's landscape is still young, having emerged from under a glacier a mere 10,000-20,000 years ago. As the glacier melted and moved, it bulldozed surface materials depositing them distances away in the forms of "till, sand, and gravel, marine silt and clay, and glacial - lake sediments."[2] These materials formed the basic ingredients of the soils which are in existence today.

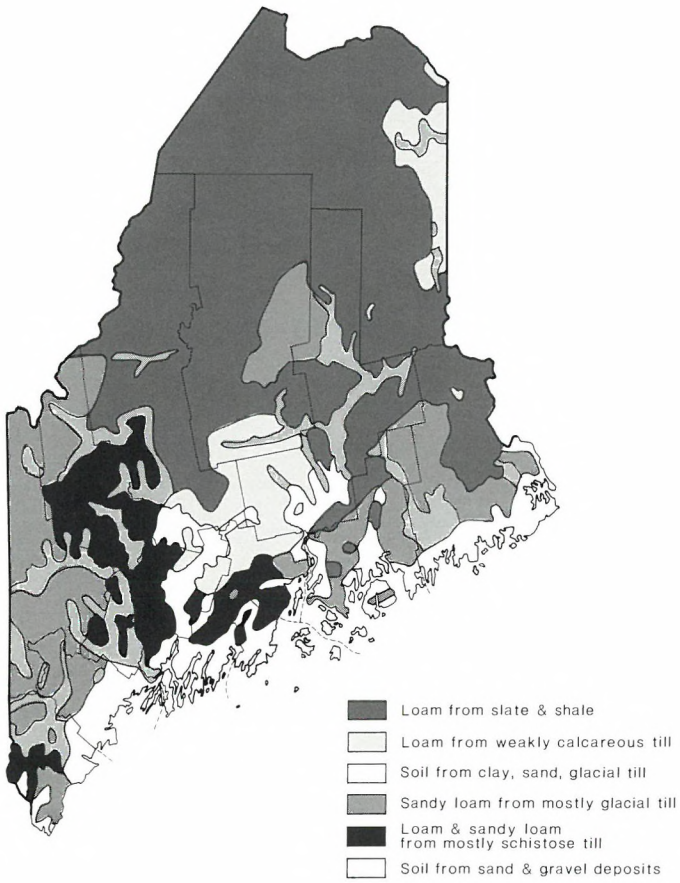
As the glacier advanced, it excavated valleys and scooped out lakes and ponds filling them up with its own melted liquid. The sheer weight of the estimated two-mile-thick layer of ice depressed the land under it. On the coast, the melting ice caused a rise in sea level in turn submerging coastal areas leaving 3500 miles of sharply indented rocky coastline.

Figure 7
Land Forms and Relative Relief



SOURCE: Maine Audubon Society

Figure 8
Soil Associations



SOURCE: *The Soils of Maine*

Throughout the State, wetlands provide the transition zone between terrestrial and aquatic environments. Wetlands "serve as food producers, spawning sites and sanctuaries for many forms of fish and bird life. They produce timber, peat moss and crops....They serve as storage areas for storm and flood waters, reduce erosion, provide for groundwater retention, and at times, purify polluted waters."[3]

Over time, streams have altered their courses, cutting valleys into the landscape and depositing streambed materials long distances from their origin. Soils were formed from the materials left by the glacier, combined with particles of vegetation found upon them, weathering of bedrock underneath them, climate, and time.

Soils act to provide trees and other vegetation with space for root development and growth, with water and nutrients, and provide a medium for seed germination. Currently, detailed information on Maine soils is sorely lacking, with only about forty-seven percent of the State soil-mapped. Such information is useful in planning for roads, erosion control, and other aspects of forest management activities. The United States Department of Agriculture-Soil Conservation Service (SCS) has begun intensive mapping of soils throughout the State; however, the project is not expected to be completed before 2005.

Tree Harvesting and Soil Impacts

Human activities in the forest, especially tree harvesting, affect soil quality.

The type of harvest a forest landowner chooses generally fits into two broad categories — *intermediate cutting* and *regeneration cutting*.

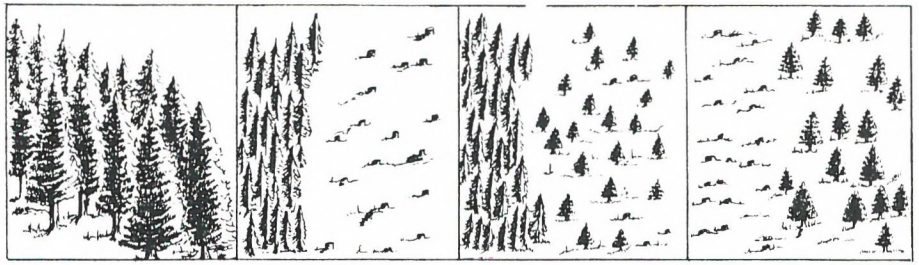
An intermediate cut is done when the landowner wishes to improve the growth of valuable trees by removing poorer quality competing trees. This is accomplished by a *precommercial thinning* in which trees are removed which are too small to be marketed or as a *commercial thinning* in which the trees removed are of marketable value.

Harvesting of trees for regeneration allows a landowner several options (Figure 9). Each method has its own set of advantages and disadvantages. Landowners should apply the method best suited to the species growing on the site and the stand conditions at the time of harvest.

Depending upon the slope of the land, other types of vegetation and the texture and type of soil, clear cutting has the greatest potential for soil erosion. The larger the clear cut site, the greater the potential. Likewise, when most areas are clear cut today, they lose the natural, nutrient-rich litter provided by a continuous supply of needles, leaves, and branches falling from trees. Furthermore, increased sunlight and heat upon

Figure 9

Tree Harvesting Methods



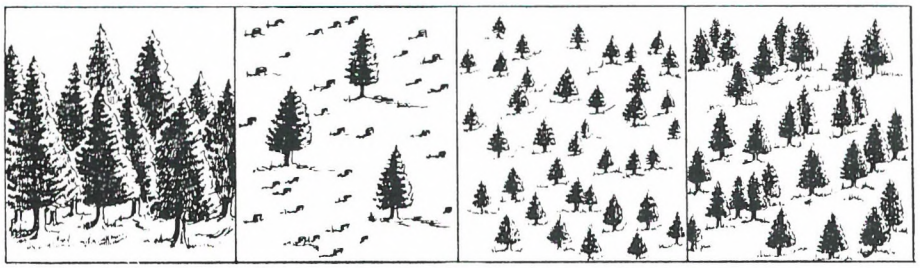
CLEARCUTTING **— Removal of the entire stand of trees in one cutting with reproduction obtained by artificially seeding or planting by natural reseeding from adjacent stands.** ***STRIP, PATCH, OR BLOCK CUTTING*** **— Modification of clearcut system.**

ADVANTAGES

- The cost of logging and transportation are reduced.
- Easier than other systems.
- New growth can take advantage of full sunlight.
- Replanting to more desirable species made easier.
- Natural regeneration of intolerant species such as white birch.
- Small clearcuts provide an edge effect and improve wildlife habitat.

DISADVANTAGES

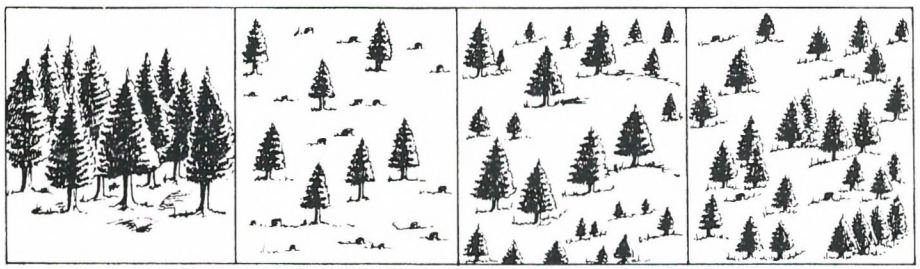
- Total removal of forest cover.
- Risk of erosion.
- Danger of fire if slash is left.
- No merchantable materials for many years from the area harvested.
- No direct seed source; planting of desired species required.
- Aesthetically unattractive.
- Vegetation control of undesired species may be needed.



SEED TREE CUTTING **— Removal of the mature timber in one cutting, except for a small number of seed trees left singly or in small groups.**

- Better control of desirable new species regeneration than with clearcutting.
- The cost of logging and transportation are reduced.
- Easier than other systems.
- New growth can take advantage of full sunlight.

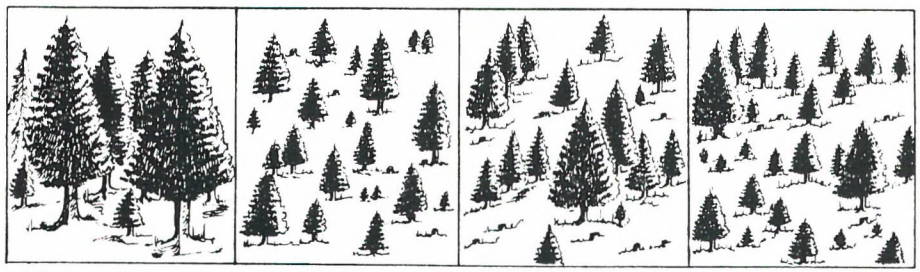
- Risk of blowdown.
- Many seeds must be available to be dispersed by the wind.
- Scarification of topsoil needed for desired regeneration.
- Vegetation control of undesirable species may be needed.



SHELTERWOOD CUTTING **— A regeneration cutting in a more or less mature forest designed to establish a new crop under the protection of an overstory.**

- Reproduction is more certain.
- Residual trees should be the highest quality in the stand, thus providing a good seed source.
- Best, phenologically superior trees retained for seeds.
- Seedlings develop in the shelter and shade of the older stand.
- Site is protected.
- Less risk of erosion.
- Slash disposal less necessary.

- Markets must be available for small and low quality trees.
- Greater skill in logging is necessary.
- Risk of damage to residual trees during logging.
- Risk of blowdown.
- Not suitable to regenerate all species, i.e., intollerants, such as white birch.
- Greater inspection of logging operations needed.



INDIVIDUAL TREE SELECTION **— Removal of the mature timber, and thinning the intermediate-sized trees either as single, scattered individuals or in small groups at relatively short intervals, repeated indefinitely, by means of which the continuous establishment of reproduction is encouraged and an even-aged stand is maintained**

- Volume of growth is sustained or increased for the life of the stand.
- Resulting stand is left with desirable trees or species.
- Adequate regeneration following harvesting operations.
- Reduced blowdown problem.
- Advantageous for wildlife.
- Danger of fire is less since fuels are shaded.
- Asethetically most pleasing.

- Markets must be available for small and low quality trees.
- Greater skill in logging is necessary.
- Risk of damage to residual trees during logging.
- Cost of logging tends to be higher.
- Reproduction of some valuable shade intolerant tree species may be difficult.
- Highest degree of supervision required.

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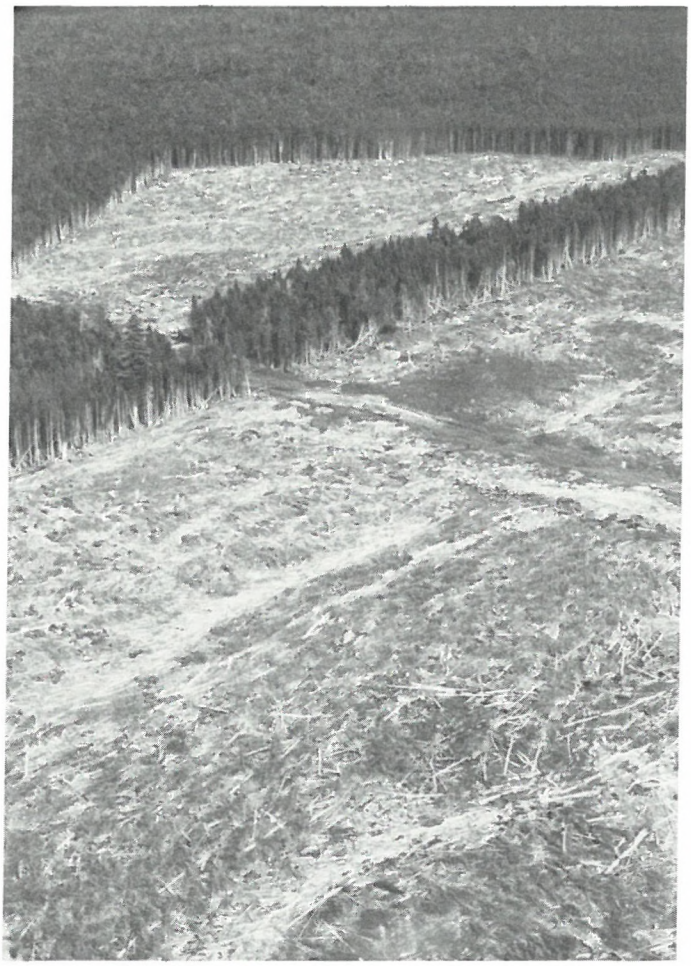
the clear cut area accelerates the breakdown of decaying matter resulting in more leaching of nutrients. If the area is located near a body of water, the increased sunlight may warm the temperature of the water with possible detriment to fish.

Opening up of large areas simultaneously alters habitat for wildlife. On the one hand, the practice destroys food and shelter for current species. On the other hand, clear cutting affords an opportunity for "edge" flora to seed themselves providing berries and browse to other more diverse species of wildlife. In addition, ground birds use the area for nesting sites and small animals find shelter.

If clear cuts are in small strips, patches or blocks and follow the natural terrain of the land, many disadvantages of clear cuts are lessened while advantages are maintained.

Private consulting foresters and woodland owner assistance foresters aid landowners in making decisions about harvesting their woodlands. The Maine Forest Service-Forest Management and Utilization program (formally known as the Service Forestry Program) discussed more fully beginning on page 79, has provided information and technical assistance to landowners for forty years. Information on soils is included in foresters' advice to landowners.



Many tree species are adapted to a particular set of soil and drainage conditions. Which species to plant, which trees to mark in a thinning operation, which soils better anchor tree roots to prevent blowdown, which is the best harvesting system for the particular site are all considered by the forester. Soil characteristics also affect the harvesting system used and determine road building constraints.

Chainsaw or Feller, Horse or Skidder

As with methods of harvest, the types of equipment used in the woods are varied and have differing impacts on soils. Equipment can range from an operation consisting of one person with a chainsaw accompanied by a trusty horse for dragging logs out of the woods to a multi-person operation with large pieces of equipment.

Large mechanical equipment, especially large skidders, if used improperly, may leave deep ruts in the woods, compact the soil, encourage erosion, and do damage to the root systems of trees left standing. Furthermore, if equipment continually skids across streams, or if much slash is left in streams, channels may be altered. Fish may find their migratory routes barricaded. When the remaining trees in a stand are damaged by equipment, their merchantable value is reduced. Wounded trees are left vulnerable to insect and disease attack. The quality of the stand is lowered.

Over the years woods machinery, like agricultural machinery, has become large and more powerful. Technology has advanced to such an extent that in some operations the following scenario can take place: A tree is felled by a feller buncher and placed in a pile of other felled trees. The pile is picked up by a grapple skidder,

twitched along a skid road to a haul road, put into a mechanical delimber where it is stripped of its limbs and top, cut into specified lengths, picked up by a mechanical loader, hoisted onto a wheeler and trucked to the storage yard. From there, it is hauled to the mill where, if pulp wood, it is ground into pulp and transformed into paper! Only after it is printed is it first touched by human hands as they unfold the newspaper over a morning cup of coffee.

This highly mechanized large scale operation has pointed out the need for research in and development of smaller machinery which can be used for more intensive management techniques. Among the experimental ventures which are currently underway is a joint effort between Seven Islands Land Company, the Cooperative Forestry Research Unit of the University of Maine at Orono, and an independent logging contractor to develop a cable yarding system suitable for woodland use in Maine. Targeted for use on high quality, smaller diameter stands and sensitive areas such as steep slopes and wetlands, the experimental system transports trees above the ground to a haul road. Minimal or no soil disturbance results, root systems are left intact, and the remaining trees are relatively unscathed.

Table A

Tree Harvesting Equipment

TREE-FELLING EQUIPMENT

Chainsaw
Mechanical feller — tree shears
Feller-buncher — an improvisation of the feller which clamps, shears, then lifts the felled tree and places it with others to be yarded.

YARDING EQUIPMENT

(for bringing felled trees out of the woods)

Animals
Homemade devices, or jitterbugs — generally a modified four-wheel drive truck or other military equipment
Rubber-tired tractor with winch
Crawler tractor — a tractor with steel tracks; advantages are: manueverability in heavy brush, good traction in mud, and with blade can act as earth mover
Skidder — four-wheeled, rubber-tired articulated tractor with integral logging arch for dragging material along the ground; has the advantage of better traction over rocks than a crawler tractor and can yard wood faster.
Forwarder — has a cart or bunks (rails) to carry logs, trees or stems
Cable yarder — consists of a series of cables and winches which draw the tree, suspended from the ground, to the yarding site

DELIMBING EQUIPMENT

(for cutting limbs and tops from trees)

This operation can be done either at the stump of the felled tree or at the yarding site.

Chainsaw
Mechanical delimber — has a set of semi-circular knives or similar cutting system which encircles the tree's stem. Limbs are cut off as the stem is pushed or pulled through the system
Homemade delimber — usually a mesh fence through which a stem is pulled

BUCKING EQUIPMENT

(for cutting into specified lengths, generally 4 or 8 foot lengths)

Chainsaw
Slasher

LOADING EQUIPMENT

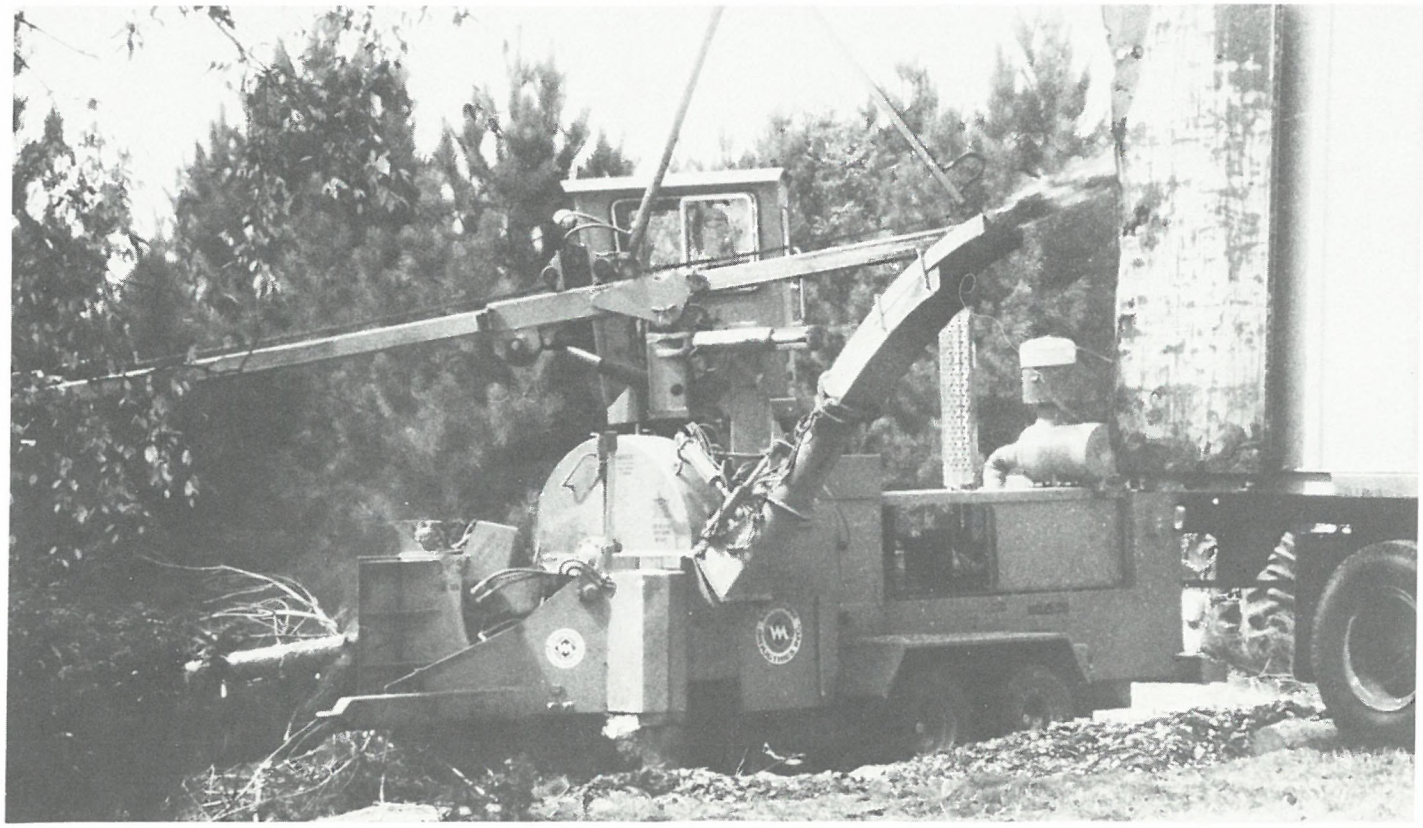
(for loading logs for transporting)

Human hands — if sections are in no more than 4-foot lengths
Brows and rollways
Conveyors
Hydraulic knuckle — boom loader
Heel boom loader

TRANSPORTING EQUIPMENT

Farm truck — single rear axle
Wheeler — 10 wheels
Tri-axle — 14 wheels
Semi-trailer — 14 or more wheels
Tractor train — pulling unit plus one or more trailers
Railroad cars

SOURCE: Maine Forest Service



Whole Tree Chipping

Traditionally, wood has been taken out of the forest in tree lengths, or in four foot lengths for pulpwood and from eight to sixteen foot lengths for sawlogs. Limbs and tops are cut off and left as slash to nourish the remaining forest. Technology now allows trees to be brought out of the forest to a centralized delimbing - loading area where the limbs and tops are removed, and are left in piles alongside the road. A new concept — "whole tree chipping" — allows all portions of the tree to be completely removed from the forest.

Since the energy "crisis" in 1973, the search for energy alternatives has put new pressures on the forest. Whole tree chipping is one result. In whole tree chipping, trees are cut very close to ground level, skidded to an access road, and fed into one end of the equipment, gobbled up, and blown out the other end as chips, into a waiting truck. These chips are then hauled to boilers which convert them to energy. Alternatively, logs may be delimbed and converted into uniformly-sized chips to be used for pulp. Some companies are even experimenting with converting chips into methanol. Thus, entire trees including stems, branches, twigs and leaves — the most nutrient rich portions of the tree — are removed from the forest. Environmental questions have arisen. Current study is underway at the University of Maine and other institutions on potential nutrient loss. In preliminary investigations, a study done by the U.S. Forest Service Southeastern Forest Experiment Station in North Carolina, concluded that twice as much nutrient loss may result when trees are removed before debarking or delimbing than in conventional harvesting methods of leaving slash at the trees' stumps.

Roads in the Forest

Often haul roads and trails must be constructed to provide access to yarding areas where wood has been hauled from the cutting site. Road construction can have direct impacts upon the soil. "When the top soil of the forest floor is torn up and roads and trails are constructed, the natural filtering action of the soil is destroyed. Trucks and yarding equipment then cause compaction, particularly on the finer-textured soils. When it rains or the snow melts, surface water is not absorbed. Instead, the surface water flows into the roads and trails which act as man-made streams that increase in speed and volume as they flow downhill. As the water flows, it tears away the soil."[4] Good road and trail layout, however, can help mitigate this water action.

To salvage spruce budworm damaged trees, landowners have filed increased requests with the Land Use Regulation Commission (LURC) to exceed limits established by standards or to cut in permit-required areas such as in mountain areas or on steep slopes. LURC issued 129 such permits in the period 1972-76. During the next four years, 1977-80, the number of permits doubled to 258. These salvage operations have increased road construction. The Paper Industry Information Office (PIIO) estimates 1000 miles of new roads were constructed annually during the 1970's.

Standards have been set in Maine to govern construction of logging roads, bridges and culverts in certain areas of the State to prevent ground disturbance and possible siltation of nearby streams. The Department of Environmental Protection (DEP) is responsible for maintaining water quality in the State through such laws as the Mandatory Shoreland Zoning Act (12 MRSA §4811-4814) and the Site Location of Development Law (38 MRSA §481). The former "regulates land use activities within 250 feet of Great Ponds and flowing waters downstream from the point at which they drain a land area greater than 25 square miles." The latter places restrictions on the accumulation of slash near water, limits size of openings in the forest, and regulates soil erosion.

The Department of Environmental Protection joins with the Land Use Regulation Commission in the Unorganized Territory in enforcing road standards. In 1979, LURC completed a study entitled "A Survey of Erosion and Sedimentation" in which 405 tree harvest sites, upon which harvesting had been completed, were surveyed for possible erosion, 172 sites were in the Unorganized Territory and 233 in organized municipalities. Haul roads and skidding operations were the focus of the survey. The LURC analysis indicated that of the 405 sites surveyed, 22 percent showed decline in water quality, with more than half resulting from skidding. Much of the remaining water quality decline was due to poorly constructed haul roads and yarding operations. A follow-up study written in 1983 surveyed 56 active or recently completed harvesting operations: erosion problems occurred on 52 percent of those sites.

When soils are fragile, accelerated erosion will occur and considerable amounts of soil material may be transported by rain or snowmelt into a nearby stream. Too much sediment in the stream may destroy fish spawning areas by smothering the eggs, or cause mortality of sac fry in the deeper nursery habitat. The adult habitat may also be threatened when silt settles out into deeper pools. Increased sediment can cause an increase in water temperature and a decrease in food production due to a reduction in the amount of sunlight that stimulates photosynthesis. Advancing along the food chain, the decreased food production affects the number and diversity of invertebrates which, in turn, serve as nourishment for fish.

Water in the Woods

The forest is essential to water quality and quantity. "Forest cover intercepts rainfall and cushions the impact of falling rain on soil."[5] The forest floor absorbs water like a sponge, preventing excessive runoff and lessening seasonal flooding. Tree roots break up the soil allowing water to filter through more easily.

The environmental ethic runs strong in Maine. Much effort and expense have been incurred in successfully attaining a high level of water quality by controlling pollutants entering Maine's lakes and ponds, rivers and streams. As of 1982, the Department of Environmental Protection had identified less than one percent of the State's lakes and ponds as GP-B or "problem" lakes. Nearly all of Maine's lakes are classified as GP-A, meaning that their water quality is good to excellent. The State's more than 32,000 miles of rivers and streams are classified according to a water quality-based five-class system. Most rivers and streams in the heavily forested portions of Maine are classed as either A or B-1, the two highest classifications. Waters subject to significant levels of pollution are generally classified as B-2 or C. Class D is reserved for severely contaminated rivers and streams. Class D is now limited to relatively short stretches on only a very few Maine rivers. Table B describes Maine's classification system for rivers and streams.

Prevention of Soil and Water Degradation

The State's Soil and Water Conservation Commission and Districts provide advice, information, and education on erosion and sediment control in forested land. One of the goals of the Commission's Long Range Plan is to expand such efforts in cooperation with the Maine Forest Service. LURC and DEP conduct training sessions to help loggers understand the regulations that apply to road layout and construction. Occasionally

Table B
Department of Environmental Protection Classifications for Maine's Rivers and Streams

CLASS	CHARACTERISTICS	PERCENT RIVERS & STREAMS*
A	Uncontaminated by sewage or agricultural runoff; no water treatment, other than disinfectant, is needed for drinking purposes.	20
B	Low levels of contamination, with all (or most all) sewage inflow having received at least secondary treatment; suitable for swimming and fishing, but requires treatment for drinking purposes (further subdivided into B-1 and B-2 on degree of contamination).	23 (B-1) 23 (B-2)
C	Normally subject to some pollution from untreated sewage; water contact sports are not recommended; meet fish habitat requirements and are suitable for fishing and boating.	27
D	Heavily polluted by municipal and/or industrial wastes; not suitable for fish habitat or water recreation of any kind.	1

SOURCE: Department of Environmental Protection

*Rivers and Streams over 20 miles in length.

funds are available, through the Agricultural Stabilization and Conservation Service, to small landowners to aid them in erecting erosion control structures and constructing logging roads. The Soil Conservation Service and the Maine Forest Service often provide technical assistance.

Several of the vocational schools throughout the State offer curricula in forestry. The emphasis is upon wood harvesting, use of equipment, and the mechanics of thinning stands. More attention needs to be devoted to "the interrelationships between the forest and such intangible products as conservation and recreation."[6]

The Maine Forest Service assists all of these organizations when requested. The agency also conducts a Harvesting Improvement Program, until recently funded jointly with the U.S. Forest Service, in all aspects of harvesting. From felling and bucking to chipping and transporting wood, the goal of the program is to achieve more complete and better use of each tree harvested. Prevention of soil erosion is also stressed. The care with which workers use woods equipment determines the condition of the forest for decades to come.

Mining: A Mixed Blessing?

Although logging operations most affect Maine's forest soils, other endeavors are of significance as well; renewed interests in mineral exploration is one example. Thus far, only a few companies have provided enough encouragement for developers to submit proposals to mine. As one example, mining of a copper-zinc deposit on Bald Mountain in T12 R8 raises serious environmental quesitons. They center around highly acidic mine wastes and their capacity to move from the waste site, infiltrate the soil, and enter the underlying ground water eventually making their way to surrounding bodies of water. Of even greater consequence would be contamination of the reclaimed area by mine tailings, containing sulfide and heavy metal salts, which do not support vegetation. The State has recognized the economic potential of mineral exploration and has established a policy of "encouraging sound and orderly" mineral development so long as such development "adheres to sound and effective land use, environmental safety and health regulations" (36 MRSA §2853). Review of the proposal is being conducted at the State level by the DEP, LURC, Office of Energy Resources, State Planning Office, Department of Inland Fisheries and Wildlife and the Maine Geological Survey.

Mining for Peat

A second type of mining which may have impact upon the forest ecosystem is the harvesting of peat. Peat, "partially decomposed organic matter and inorganic materials that have accumulated in a water saturated environment,"[7] offers promise as a substitute for conventional fuels.

Wheelabrator-Frye Inc. of New Hampshire has conducted peat mining feasibility studies. They are now discussing possibilities with agencies such as LURC, DEP and the Department of Inland Fisheries and Wildlife.

Plans to harvest peat must be assessed carefully. Peat, already used in horticulture, regenerates very slowly. Harvesting may affect ground and surface water both at the extraction site and beyond. The Maine Forest Service's role in peat development is to advise so that areas which are better suitable for tree growth are not developed for peat production.

Gravel Mining

In 1980, nearly seven million tons of sand and gravel were excavated largely from the unique network of eskers throughout the State. Although the products of this mining are essential in construction and road building, improper mining techniques can result in threats to water quality, human health and safety and forest productivity. Recent legislation requires the restoration of some gravel pits. But many older abandoned pits have not been reclaimed.

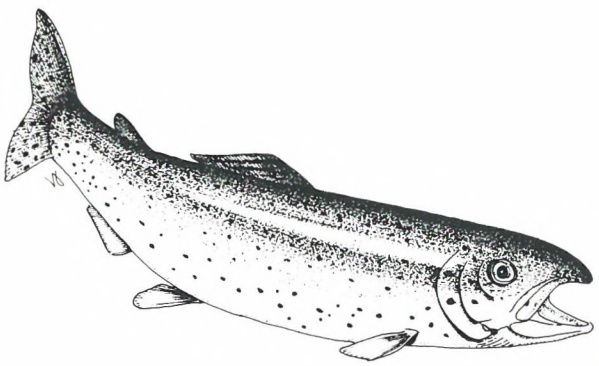
Hazardous Wastes

Although the issue of hazardous wastes has gained nationwide significance, very little is known as to the extent of the situation in Maine. Nationally, the potential for great damage to soil and water has been recognized and in some cases already witnessed.

The State Department of Environmental Protection and Board of Pesticides Control (in cases of pesticides) have primary responsibility for investigating reports of hazardous waste sites. Much more is needed in both research and assessment to determine future action.

Acid Rain

The relatively recent phenomenon known as acid precipitation or acid rain is another threat to the intimate forest-soil-water relationship. The condition "is produced when airborne sulfur and nitrogen oxides combine chemically with moisture in the air to produce dilute concentrations of sulfuric and nitric acids. Sulfur dioxide, produced primarily by coal-fired power plants, is responsible for approximately 70 percent of the acid precipitation problem. Prevailing winds are carrying sulfur oxides to Maine and to other New England States from coal-burning plants as far away as the midwest. Nitrogen oxide, the second largest source of acid precipitation, is primarily emitted by transportation-related sources."[8]



The problem has become pronounced since, in attempting to reduce concentrated air pollution in local areas, industries have sent the problem downwind. The tall industrial smokestacks which environmental laws have promoted, send the particulates into the upper atmosphere. Winds pick up the particulates and transport them hundreds or thousands of miles away. They then combine with precipitation or just settle out of the atmosphere and fall to earth. Maine is one of the northeastern states affected.

There is speculation that the productivity of forests may be declining due to acid rain. In a recently published study done by Siccama, Bliss & Vogelman on Camel's Hump, a peak in the Green Mountains of Vermont, preliminary indications show that as many as 50 percent of the red spruce have died or show slowed growth. Tests are still being conducted, but acid rain has been implicated. By altering the basic nutrient content of the soil, by freeing heavy metals in the soil so they can be absorbed throughout the root system, by reducing photosynthetic capacity of leaves of trees, and even by damaging the protective covering on the leaves which wards off insect attack, indications are that acid rain may have already begun to have an impact. Particularly sensitive are Eastern white pine, long revered for its quality; red spruce; and species of ash and birch.

The scenario is particularly discouraging when, within a few years, a once productive lake becomes a deathtrap for its inhabitants as the increase in acidity dooms everything from microscopic phytoplankton to species of fish. Actual problems have been documented in lakes in the Scandinavian countries and northern New York State. Monitoring efforts are underway by DEP and the University of Maine, but there is already documented evidence that water quality degradation linked to acid rain has occurred in all of the New England states. Much more research is needed to evaluate effects on forest soils, on growth and foliage of trees, combined effects of acid rain and pesticides as well as contamination of ground and surface water. A specific course of action for dealing with acid deposition is needed. In 1982 and 1984, during conferences of the New England Governors and Eastern Canadian Premiers, acid rain was the principal topic. The conferences called for the U.S. Environmental Protection Agency to enforce air quality standards and control interstate pollution through the Clean Air Act. The governors and premiers also strongly recommended that legislation be introduced.

Ten to twenty percent of the precipitation which falls to earth "infiltrates soil and rock and recharges the groundwater reservoir."[9] The danger to water quality from mineral mining; acid rain; and, as we shall see in a subsequent section, the use of pesticides becomes more awesome when it is realized that "45 percent of Maine's people use groundwater for their domestic water supply"[10] either from wells or springs, or as their municipal water system.

Identified Needs for Action Related to Soil and Water

Soil types and conditions influence the species and growth rates of trees found in Maine. Many areas of the State have poor quality soils — soils that are infertile and often highly erosive. The forest helps protect soils and prevent erosion, but poor logging practices can cause problems.

Water in Maine is an abundant, high quality resource. It is essential for maintaining animal and plant life. It is vital to Maine's recreation industry.

The following represents needs which have been identified in Chapter Two, Section A. These needs are translated into Actions to be Taken in the **Action Plan** beginning on page 108. The **Action Plan** contains detailed work of the Divisions of the Maine Forest Service. The Actions found in the **Action Plan** may address more than one need as expressed in this section or in other sections of this chapter.

Needs for Action:

Education

- Include erosion and sediment control techniques in tree harvesting and road building activities as an integral part of the curriculum in forestry courses in vocational schools.

Education and Timber Management & Wildlife

- Provide technical information and assistance on prevention of soil and water degradation to landowners, loggers and foresters. Coordinate efforts with regulatory agencies such as the Department of Environmental Protection and the Land Use Regulation Commission.

Timber Management & Wildlife

- Provide loggers, landowners, and foresters with specialized assistance on soil and water problems associated with road construction, harvesting systems, pesticides, and forest hydrology.
- Examine and evaluate the environmental and economic issues in whole tree chipping.

Planning

- Complete a statewide soil survey to benefit agencies in determining what Maine's soil conditions are and what needs to be done to maintain soil and water quality.

Research

- Promote research on the effects of whole tree harvesting, soil compaction, use of fertilizers and pesticides, tree defoliation and mortality, acid precipitation, and fire upon soil and water quality. The results of such research would be beneficial in making decisions related to forest management and to fire, insect and disease control.
- Promote research on the effects upon wildlife of the various tree harvesting methods.

Footnotes — Chapter Two — Section A

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[2] Thompson W., **Surficial Geology Handbook for Coastal Maine**, pub. by Maine Geological Survey, 1979.
[3] Conservation Foundation, **State of the Environment**, (Washington, D.C., 1952), p. 249.
[4] "Erosion Control on Logging Jobs", **The Land Use Handbook**, Section 6, Department of Conservation, Land Use Regulation Commission.
[5] Ferguson, Roland and Neal Kingsley, **The Timber Resources of Maine**, Unites States Department of Agriculture Forest Service, Resource Bulletin NE-21, 1972, pg. 24.
[6] "Dexter Regional Vocational Center Curriculum," Dexter, Maine.
[7] Davis, Joel, "Global, National and Regional Perspectives of Peat as an Energy Resource," Office of Energy Resources, Augusta Maine, p. 1.
[8] **Acid Precipitation and the Long Range Transport of Air Pollutants in Canada and New England**, prepared for the New England Governors and Canadian Premiers, June, 1982, p. 5.
[9] Caswell, W. G., **Groundwater Handbook for the State of Maine**, PR-1, Maine, p. 60.
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CHAPTER TWO—Section B

Fires In The Forest

Wildfire can be the most feared natural element in the forest. An uncontrolled forest fire has the potential to destroy human lives, wildlife, wildlife habitat, property, timber, and soil and water quality. It knows no boundary lines and it sometimes acts in unpredictable ways. It can be terrifying when forests are dry, and winds are strong. Over the years, the loss in Maine has been as shown in Table C.

The loss of human life to fire obviously cannot be measured in financial terms. Wildlife suffer losses from fire either directly, or indirectly when their food supply and cover are destroyed. The survivors must move into new habitat areas with risk of overcrowding and heightened competition. Fragile habitats, such as wetlands, fish spawning areas and deer wintering areas may be particularly damaged.

Trees can be partially or completely destroyed by fire. In some instances, fire-killed trees can be salvaged for wood products, but timeliness of harvest is necessary if insects, diseases, and decay are to be avoided. Unless a burned site is managed, or a desirable species reseeds the site, often a once productive, high quality stand of trees can be reduced to an inferior mass of brush and woody shrubs when the area begins regeneration.

The forest floor can also suffer from fire. Intense fire burns the spongy mat of litter and humus leaving sterile mineral soil. Runoff and erosion often follow and flooding may result. Intense fire consumes most of the trees, opens the forest canopy and allows the temperature of the soil to rise. The humus layer then decomposes more rapidly, diminishing the productivity of the site. Little is known and more research is needed on the long-term impacts of fire upon soil.

Water quality is also affected when roaring flames send heat into nearby streams and burned debris falls into the water. Lye leaching from ashes can be fatal to fish populations. Sedimentation, resulting from erosion at the burned site, can affect fish and aquatic invertebrates. Later, because the forest canopy is open, sunlight continues to keep the temperature of the water higher and reduces the amount of dissolved oxygen the water can carry.

Wildfire can affect recreational opportunities. At worst, it may completely destroy the recreational value of the area. Aesthetically, viewing a favorite recreational area in charred ruins can be devastating. Generations will need to pass before the site will have the same appeal as before the fire.

Table C

Number of Fires in Maine, Acres Damaged and Cost, 1803-1983

Year	Number of Fires	Acreage	Damage in Dollars*	Year	Number of Fires	Acreage	Damage in Dollars*	Year	Number of Fires	Acreage	Damage in Dollars*
1903	345	267,587	$947,588	1930	263	33,309	$143,861	1957	726	30,967	$316,277
1904	31	6,958	12,655	1931	226	4,807	52,997	1958	221	1,562	11,676
1905	142	20,316	63,623	1932	321	42,827	69,807	1959	485	6,572	57,234
1906	67	7,621	21,028	1933	281	15,294	48,927	1960	472	2,810	128,302
1907	33	4,524	14,567	1934	266	136,370	421,664	1961	402	3,438	27,265
1908	237	142,130	618,816	1935	301	18,828	37,558	1962	463	1,808	99,543
1909	157	39,028	96,699	1936	136	1,640	20,295	1963	544	3,582	58,000
1910	30	848	2,841	1937	262	5,713	30,214	1964	695	3,582	20,603
1911	202	111,077	337,355	1938	173	16,139	35,521	1965	972	16,480	24,010
1912	99	20,240	71,548	1939	287	7,433	36,710	1966	580	1,361	11,611
1913	194	30,214	176,842	1940	240	4,111	22,936	1967	347	1,619	7,045
1914	157	15,716	29,307	1941	481	40,350	511,340	1968	516	6,248	45,533
1915	156	25,657	78,116	1942	225	4,993	11,633	1969	300	2,399	10,270
1916	72	11,616	19,765	1943	131	7,168	39,910	1970	430	1,011	56,439
1917	28	458	2,134	1944	408	24,203	278,864	1971	476	767	68,546
1918	79	8,938	77,891	1945	214	4,950	64,583	1972	430	1,652	57,616
1919	104	5,020	8,930	1946	576	10,327	95,932	1973	374	1,508	28,492
1920	165	39,803	185,908	1947	700	213,547	11,990,855	1974	684	2,266	76,395
1921	362	68,830	517,115	1948	814	7,241	135,433	1975	911	1,973	144,186
1922	216	21,388	114,776	1949	763	21,052	65,841	1976	727	6,360	122,192
1923	181	70,339	341,366	1950	951	18,051	164,791	1977	975	10,075	233,740
1924	220	40,357	113,788	1951	421	3,685	30,981	1978	1,024	3,170	67,435
1925	115	6,053	43,118	1952	948	24,695	625,951	1979	851	3,829	177,720
1926	144	12,212	52,181	1953	877	14,558	120,055	1980	1,029	2,255	175,076
1927	109	11,620	129,354	1954	341	3,180	22,522	1981	1,027	3,905	48,856
1928	64	2,814	6,035	1955	490	1,782	29,477	1982	840	1,529	42,622
1929	168	2,465	44,757	1956	443	2,580	13,076	1983	650	1,185	151,342

SOURCE: Maine Forest Service

*Dollars not adjusted for current value

Economically, timber and property losses are sustained. Obviously the loss in timber value is relative to acreage burned, tree species, age, diameter and quality of the timber. Likewise, the loss in property value is a product of location, structures, market value, and use to which the property was put.

Fire Fighting Gets Organized

The Bureau (of Forestry) shall: Have the responsibility for the control of forest fires in all areas of the State.

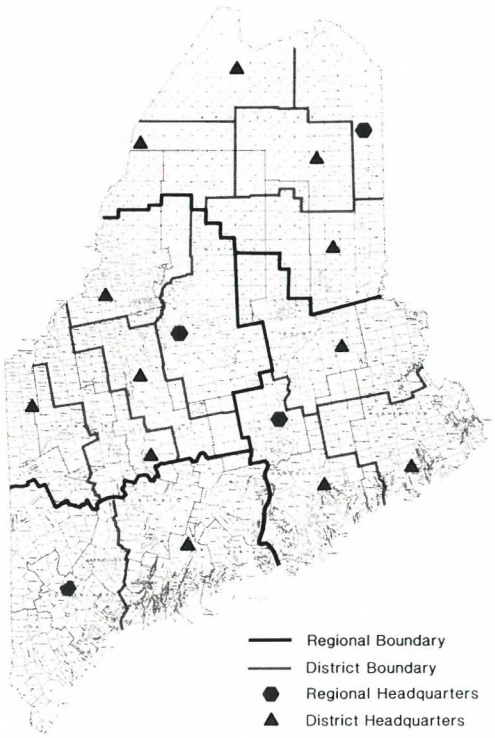
—12 MRSA §8002 Sub §1

The Maine woods has experienced only a few major forest fires in recent times, but in pioneer days, the losses were much higher. Cutting practices and clearing of land, both of which left piles of brush in the woods, created fire hazards. Railroads presented risks, both from sparks from locomotives and from slash and other inflammable material left in the railroads' rights-of-way. A number of early laws were enacted aimed at fire hazards.

The origin of the present Maine Forest Service was due largely to citizens' concerns regarding fires. The following discussion centers predominantly upon the development, structure, organization and programs of the Maine Forest Service. (Figure 10 depicts the regions and districts of the present Maine Forest Service Division of Forest Fire Control.)

Although the Maine Forest Service was instituted in 1891, no funds were appropriated to nurture the fire protection effort. In 1903, a year in which large fires occurred, emergency funding was made available (P.L. 1903, C. 168). By 1909, landowners were incurring increasing expenses for patrols, lookout towers, and actual firefighting — the latter a cost they shared with the State. Although the organized towns could handle firefighting within their boundaries, the need for a central unit responsible for fire protection in the Unorganized Territory was clear. Thus, the Maine Forestry District (MFD) was created (P.L. 1909, C. 193) whereby landowners within the Unorganized Territory were assessed a self-imposed tax based on the value of their acreage. The Forest Commissioner (now the Maine Forest Service Director) was given responsibility for the forest fire-fighting organization. The Legislature requested a ruling by the Maine Supreme Court as to the constitutionality of the new tax. The Court determined that "taxation for local purposes by assessments upon property benefitted, and in proportion to the benefits conferred upon it, are valid. The forestry tax was not a tax for public purposes, but for the special benefit of the forest lands within the district." Furthermore, the funds were "to be used to protect from fire the forests situated upon and within the district...and to pay expenses incidental thereto and for no other purpose" [109 ME 476 (1912)].

Figure 10
Regions and Districts, Division of Forest Fire Control, Maine Forest Service



SOURCE: Maine Forest Service

In 1911, the federal government entered the scene through the Weeks Law's provision for grants-in-aid allotments to towns which provided some form of fire protection (36 Statute, 691, §2). However, the law applied only to watersheds of navigable waters. The Clarke-McNary Act of 1924 strengthened the federal government's presence in the Maine Forest Service budget by eliminating the navigable waters provision, increasing funding, and matching state funds, thus helping those states which helped themselves.

Forest Fire Suppression And Detection

In its infancy, the Maine Forest Service's fire control equipment was rudimentary — hand fire tools and the legendary bucket brigade were part of valiant attempts at battling fires. Later, portable, lightweight equipment — pumps, hoses, relay tanks, power saws — added sophistication.

Early detection rested with a watchman alone in the fire tower scanning the landscape for signs of smoke. By the early 1950's, there were 103 towers throughout the State linked by 3500 miles of telephone lines.

In more recent times, large bulldozers, tank trucks, and plows have brought modern technology and efficiency into the firefighting effort. The use of airplanes and helicopters, equipped for water dropping has advanced fire fighting capabilities even further. Now, with the State's goal of assessing a fire within one half hour of its detection, aircraft enable fire control personnel to expedite the first call for equipment and manpower. Aircraft are also used for transporting personnel and equipment, for mapping, and for search and rescue. Aircraft have gained increasing prominence in fire detection, resulting in the abandonment of 46 towers between 1966 to 1973. Today only 28 towers remain, some more crucial for radio relay than for fire detection. Towers may be reactivated as conditions demand, however.

"Use of aircraft has been the second most important development in forest fire control. Only the advent of a radio communication network has had greater impact on virtually all aspects of the forest fire control program."[1] Maintainence of and improvements in radio communication are vital to the entire forest fire control operation.

The Maine Forest Service maintains a current inventory of equipment which contractors, industries and towns can provide in the event of a fire, plus an inventory of skills possessed by their respective firefighters. More elaborate computer equipment would greatly simplify maintaining the inventories. Likewise, more sophisticated computer programs could be beneficial

in helping to make crucial, timely decisions based on such factors as fuel type, weather, road network, terrain, and resources available.

Research into more advanced and efficient equipment is being undertaken by the U.S. Forest Service laboratories and Maine Forest Service field personnel. Field testing of equipment assesses its practicality and usefulness.

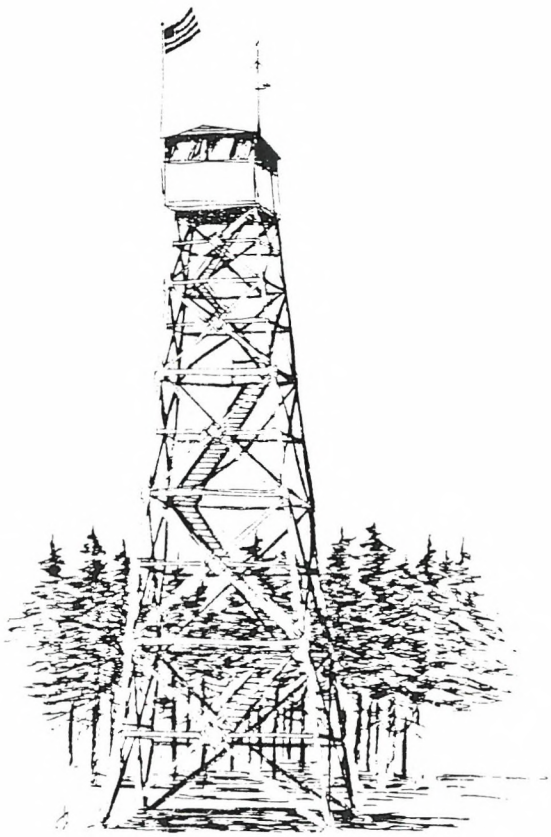
As equipment has increased in efficiency, so has it increased in cost. The Maine Forest Service has therefore been examining equipment needs and procurement. In the past, federal excess property, such as four-wheel drive vehicles, fire trucks, bulldozers, and helicopters, has constituted a major portion of the Maine Forest Service's inventory of heavy equipment. If federal surplus equipment becomes no longer available, replacing such items as a $1.5 to $2.0 million helicopter would create a tremendous burden on Maine Forest Service's budgets.

Assistance in Forest Firefighting

A critical element of forest fire suppression is training of personnel. Maine Forest Service fire control personnel receive training, sharpened by field exercises each year. Specialized training is available in such areas as fire behavior, personnel management and law enforcement. Furthermore, forest industry personnel, railroad employees, municipal firefighters, town fire wardens, local fire departments, vocational school students and volunteers receive training from the Maine Forest Service in forest fire suppression. The Maine Forest Service has also organized and trained forest fire overhead teams, composed of personnel from the Department of Conservation and private industry. The teams can be mobilized "on short notice (to fight) any fire anywhere in Maine."[2]

The Cooperative Forest Assistance Act of 1978 (P.L. 95-313) provides federal assistance to state fire agencies "in organizing, training and equipping local forces for fighting fires in rural communities under 10,000 population." This effort needs to be expanded to include more technical assistance and equipment so that towns, especially in the Organized Territory, can more readily respond to forest fires within their own boundaries.

As a result of the 1947 fires, the Maine Forest Service learned that it could not stand alone against a disaster of such magnitude. For mutual assistance, Maine entered into the Northeastern Interstate Forest Fire Protection Compact in 1949 (P and S.L. 1949, C.75). Maine, Massachusettss, New Hampshire, Vermont, New York, Connecticut, and Rhode Island and the provinces of Quebec and New Brunswick make up the Compact. The Compact provides for mutual aid in the suppression of any large forest fire, and provides a framework for integrating forest fire plans and fire control training. As the cost of equipment and personnel has increased and budgets become tighter, the philosophy underlying the Compact takes on added significance. Maine will continue participation and work to assure the Compact's value and success.



Always Looking for a Better Way

After each forest fire which "results in loss of life, exhibits extreme behavior, exceeds 100 acres, or presents any peculiar problems regardless of size,"[3] a Maine Forest Service board of review is held. The board "summarizes major suppression events, critiques adequacy of fire organization, analyzes any safety problems, studies unusual fire or fuel behavior, and, if appropriate, makes recommendations from lessons learned from the review." For example, the Baxter Park fire of 1977 burned 3500 acres. Controversy arose over the use of heavy equipment in Baxter State Park, an area which had been entrusted to the State to "forever be left in the natural state" (P and S.L. 1933 C. 3). Even the State Forest Fire Plan acknowledges the risk: "Current Maine Forest Service policy is to suppress all forest fires as soon as possible and to minimize the cost of suppression, the number of acres burned, and disruption of the environment. This often calls for the use of heavy equipment which may result in substantial modification or degradation of the immediate environment."[4] After the fire, major landowners were surveyed as to any areas upon which they would prefer modified suppression efforts. The response indicated they wanted all forest fires extinguished using current methods. The State's goal for fire suppression is in keeping with this response from landowners.

Both Friend and Foe

Since 1891, much has been learned about fire behavior and the effects of fire. Attitudes have also changed; no longer is forest fire considered only deleterious. For example, the benefits of forest fires to enhance wildlife habitat and as a forest management tool have been recognized. As a natural condition in the forest, such as when lightning strikes, fire consumes older stands of trees promoting younger growth and a rejuvenated forest. Many mammals and birds are attracted by the woody and herbaceous new growth, some of which provide browse for big game species of moose and deer. Upland game birds such as ruffed grouse and woodcock find the grassy openings attractive for nesting.

For some landowners, fire is useful as a forest land management technique. A prescribed burn, the deliberate setting of fire on a parcel of land under predetermined specified conditions of temperature, wind, humidity; fuel conditions; safety; and general preparedness, can be beneficial to burning forest litter thereby exposing the minerals in the soil. In Maine, prescribed burns are used infrequently. One of their most common uses is in site preparation prior to planting. In a deliberately set, controlled burn, forest litter and humus, both of low pH, are converted to ash of higher pH. Nitrogen-fixing bacteria function better in the more alkaline environment, and thus the soil becomes nitrogen-enriched. Planting is thus made easier and cheaper without the need for fertilizer. The increased temperature of soil, brought about by the now direct sunlight, promotes seedling growth. Controlled fire also destroys competing vegetation enabling young seedlings to grow faster. Because some harvesting operations leave large amounts of slash, prescribed burns may also be used to reduce the hazard of a large intense forest fire fueled by the slash.

Forest Fire Control Funding

Keeping abreast of new methods and technology is a crucial element in the Maine Forest Service's Division of Fire Control. Expanded knowledge increases the efficiency of the organization. Through experience, the Maine Forest Service has learned that if fires can be kept small by early detection and early response, then losses and costs can usually be kept small also. For the most part, the level of efficiency in manpower and equipment which the Maine Forest Service has built up is responsible for the low forest fire damage record of recent years (Figure 11). At present, the Fire Control Division has a goal of having personnel and equipment at a forest fire within one hour of its detection. This goal is being examined. Citizens of the State, through their legislators and administrators, must decide the level of protection the State should provide. The cost of Maine Forest Service readiness in equipment and personnel must be balanced against the volume of potential losses given certain response times.

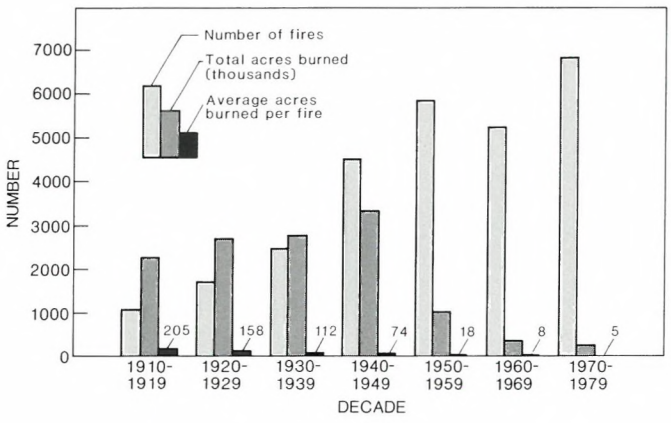
Nothing Comes Cheap

Funding for forest fire protection is an issue with which the Legislature continues to wrestle. Prior to 1983, most of the funding for forest fire protection came from the Maine Forestry District (MFD) tax. The only legislative change had been in 1979 from assessment based on acre valuation to a cost per acre. The boundaries of the MFD covered 57 percent of the State's timberland.

The disastrous fires of 1947 made apparent the need for a centralized organization. Thus, the Maine Forest Service gained ultimate responsibility for forest fire protection throughout the entire State in 1947. Previously, organized towns were dependent upon their own municipal or rural fire departments or that of a neighboring town to battle all forest fires. Today, organized towns still retain prime responsibility for fires within their boundaries, but the Maine Forest Service has authority to step in when conditions warrant.

Although Maine Forest Service responsibilities for forest fire protection changed in 1947, funding did not. Towns within the MFD continued to pay the annual tax,

Figure 11
Number of Fires in Maine, Acres Burned, and Average Acres Burned Per Fire, By Decade, 1910-1979



SOURCE: Timber Resources of Maine

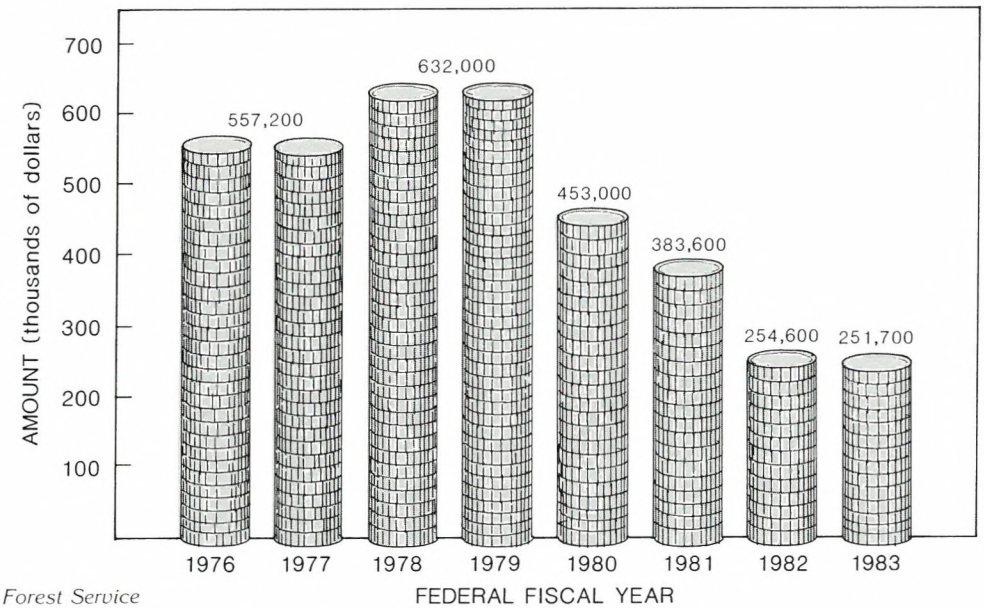
while towns outside the MFD paid only a portion of the cost of suppression in the event of a forest fire within their boundaries. Each year, the Legislature found itself presented with bills regarding towns' requests for withdrawal from the MFD. Furthermore despite rising equipment and personnel costs, the contribution of federal funds declined (Figure 12). As the number of remaining towns funding the MFD decreased, the cost to those towns became too burdensome. In 1982, the 110th Legislature established the Maine Forest Fire Control Study Commission to examine the "organization, administration, funding and delivery of services by the Maine Forest Service's Division of Fire Control" (12 MRSA §3). The Commission's report recognized the inequities of the MFD tax and recommended "that the Maine Forestry District as now constituted be abolished."[5]

The 111th Legislature accepted the Commission's recommendation, abolished the MFD, and placed a two-tier tax upon forest landowners for 1983. In organized towns which have primary responsibility for forest fires within their jurisdictions, an excise tax was levied upon owners of at least one hundred acres of protected land. In unorganized towns which rely upon the Maine Forest Service for first and full response, an additional tax was levied.

The 111th Legislature also established the Forest Fire Advisory Council (which replaced the Forest Fire Control Study Commission) to oversee all aspects of administration and conduct of the State's forest fire control program. In 1984, the Council and Legislature addressed proposed adjustments in the excise tax system. Among other changes, the acreage threshold for taxation purposes was raised to 500 acres, with the first 500 acres being exempt. The additional tax representing the cost of first response by the Maine Forest Service in unorganized towns was abolished and replaced with a system of reimbursement to the State for forest fire suppression services.

It is especially crucial that funding decisions be made. At present the Maine Forest Service is facing a fire hazard possibility as great as at any other time in this century. The spruce budworm epidemic of recent years has caused the death of many spruce and fir trees. Because so much of the forest is relatively even-aged

Figure 12
Federal Funds Received by Maine Forest Service for Forest Fire Control, 1976-1983



SOURCE: Maine Forest Service

spruce and fir, the fire hazard has increased. The threat is particularily prevalent in "buffer zones", those areas in which no insecticide spraying to protect trees from the spruce budworm takes place. Areas of human habitation are buffered as are areas around rivers, streams, lakes and ponds. These are also the areas most likely to be victims of human carelessness.

The Fire Control Division has begun to develop strategies to combat the fire threat. They are improving mapping, working closely with the Maine Forest Service Division of Entomology and, together with industry personnel, are identifying high mortality areas. To date, over 700,000 acres of extremely high hazard area have been mapped. The Fire Control Division is moving first line equipment to be closer to such areas. The Division is also consulting with Ontario, New Brunswick and Newfoundland, all of which face the same spruce budworm problems.

As landowners have increased salvage of budworm damaged or killed trees, they have had to build roads into previously inaccessible areas. This road construction has opened the area, making it easier to bring in personnel and equipment should a forest fire occur. But, greater access in turn opens new areas for recreation which in turn creates more opportunities for human carelessness with fire.

Forest Fire Prevention

Early emphasis was placed upon detection and actual suppression, but today the trend is toward a broader endeavor which includes a greater effort in forest fire prevention through education.

Austin Wilkins
***Ten Million Acres of Timber*, 1979**

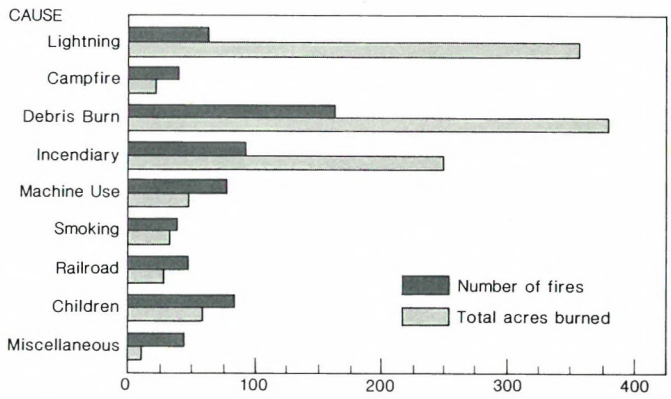
Hardly a person starts a campfire without the words of Smokey Bear "Remember — Only **You** can prevent Forest Fires" ringing in his/her ears. Every school child recognizes the furry figure clad in blue overalls and ranger hat, spade in hand (or rather paw). Truly, one of the most successful public relations campaigns, Smokey the Bear has visited classrooms, exhibits and fairs, spoken on radio shows, appeared on television, and autographed countless pamphlets and brochures.

Education and law enforcement in forest fire prevention is absolutely vital. Landowners and woods workers need education in recognizing conditions which lead to greater incidence and magnitude of fire. Harvesting practices that have less accumulation of slash do not build up fuels for fires. Sound forest management techniques which result in diversity of species and ages of trees reduce the threat of forest fires.

Fire prevention laws have been enacted to address human carelessness. These laws require the public's understanding as to the importance and value of fire prevention measures.

The fact that the three leading causes of forest fires are debris burning, incendiary (arson), and children makes education and law enforcement even more essential. Figure 13 relates the causes of fires in 1983; over the years percentages change but the ratios are fairly representative. The fundamental truth remains: As long as there are trees and people, the need for forest fire control will continue.

Figure 13
Maine Forest Fire Record by Cause, 1983



SOURCE: Maine Forest Service


SMOKEY
SMOKEY
PREVENT
FOREST
FIRES !

Identified Needs for Action Related to Forest Fire Management

Uncontrolled forest fires have the potential for vast destruction of human lives, wildlife, timber and other property. When wildfires occur on a large scale they require a well-coordinated effort with specialized equipment and human resources to effect control.

The following represents needs which have been identified in Chapter Two, Section B. These needs have been translated ito Actions to be Taken in the **Action Plan** beginning on page 108. The **Action Plan** contains detailed work of the Divisions of the Maine Forest Service. The Actions found in the **Action Plan** may address more than one need as expressed in this Section or in other Sections of this Chapter.

Needs For Action:

Education

- Increase the visibility to the general public of the Maine Forest Service's Fire Control Division through such programs as Smokey Bear and Woodsy Owl.
- Increase educational efforts to alert the public to the fire hazard created by spruce budworm.
- Continue and improve programs designed for landowners and loggers which emphasize hazard reduction, proper slash disposal, proper spark arrester maintenance, and firebreak construction.

Administration

- Inventory all available equipment and personnel resources for a more effective fire control effort. Establish guidelines which detail use of Department of Conservation equipment and personnel for fire control.
- Encourage the Legislature to establish an equipment fund for the purchase and scheduled replacement of major equipment.

Fire Management

- Continue and improve training for industry, local fire departments, railroad companies, vocational schools and volunteers.
- Conduct and improve overhead team and Ranger Academy training.
- Continue to participate in the Northeastern Interstate Forest Fire Protection Compact.
- Maintain equipment and human resource capability for an effective fire control effort.
- Enforce laws created to prevent forest fires.

Timber Management & Wildlife

- Develop techniques for prescribed burns as a useful fire prevention and forest management tool.

Forest Insects & Diseases

- Evaluate how forest pest problems affect forest fire control.

Planning

- Computerize fire control information to improve efficiency and decisionmaking.
- Improve mapping, especially standardization of presentation and scale.
- Review the policies as to cost/benefit of responding to a fire within one hour of its detection and suppression of all forest fires at any cost.
- Revise the State Fire Plan every five years.

Recreation

- Revitalize the Maine Forest Service Campsite Program and other fire prevention activities which are aimed at recreational use of the forest.

Research

- Promote development of forest management strategies, new technology, and equipment for forest fire control purposes.

Footnotes — Chapter Two — Section B

[1] **State Forest Fire Plan of the Maine Forest Service**, Department of Conservation, Maine Forest Service, Division of Forest Fire Control, March, 1979, p. 1, Air Operations.
[2] Ibid., p. 2, Suppression.
[3] Ibid., p. 5, Suppression.
[4] Ibid., p. 10, Presuppression.
[5] "Maine Forest Fire Control Study Commission Report to the 111th Legislature," January 14, 1983, p. 2.

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CHAPTER TWO—Section C

Insects and Diseases In The Forest

The success of all forest insect work depends largely on a thorough knowledge of the life history and habits of the particular insect involved, and a knowledge of the forest conditions under which serious damage is likely to result.

— Neil Violette
***Fifteenth Biennial Report of the Forest Commissioner,* 1923-24**

Thousands of species of insects and agents of disease inhabit the forest. Many are beneficial, indeed vital, to its existence. Some occur in cycles, some flourish when the forest is weakened, some are ever present. Many insects serve as food for other organisms; many act to nourish the soil. Only a handful are destructive, and then only because they are in conflict with human endeavors. Often populations are kept in check by unfavorable weather, predators, parasites, diseases, viruses, bacteria and/or fungi. When conditions are ripe and food supply is plentiful, populations break out of natural controls. These are the leaf-eating, sap-sucking, wood-boring or heartwood tissue-consuming pests of the forest. We have spent millions of dollars and much human effort in attempting to control them, sometimes with success, more often without it.

The Bureau (of Forestry) shall: Conduct programs to protect the forest, shade and ornamental trees of the State against insects and diseases.

12 MRSA §8802 sub. §1.

As early as the beginning of the twentieth century, human interest in the forest began to conflict with the natural existence of insects and diseases. The gypsy moth, accidentally introduced into this country in 1869, was one of the first serious forest insect problems of this century in Maine. It feeds on the leaves of many hardwoods, particularly oak, and sometimes softwoods. Legislative appropriations were made to combat the pest in 1905 and 1907 and again in 1917.

By this time, white pine blister rust was severely damaging highly valued white pine stands. This disease assaults the needles, spreading into the branches, and finally reaches the trunk such that the entire tree becomes affected and eventually dies. The fungus had been inadvertently brought into this country from France during a nationwide reforestation effort. Legislation was enacted in 1917 to fund initial control efforts.

At about the same time, between 1910 and 1919, a severe outbreak of spruce budworm, which feeds on needles of spruce and balsam fir, occurred destroying over 27 million cords of spruce and fir pulpwood. Although the outbreak was costly, landowners did not appreciate the full impact. Surviving trees were plentiful and supply could easily meet demand. Landowners cut these two species heavily ignoring less desirable species. Fir in particular reseeds itself vigorously. Thirty years later, a new generation of spruce and fir trees began to mature. These mature and overmature spruce-fir forests became a direct target for the next budworm attack.

The impact of gypsy moth, white pine blister rust, spruce budworm, and other less notable insects created a need for professional help. In 1921, funded by landowners, the first State entomologist assessed insect and disease damage and recommended or initiated control measures. The State started funding some entomological work in 1925. By 1927 white pine weevil had become a severe problem especially in pure white pine stands. White pine weevil larvae feed in the terminal shoots or leaders of the tree deforming it into a knotted, crooked specimen with a forked top and multiple stems. The tree's merchantable value is greatly reduced.

During the 1930's chestnut blight obliterated most of the State's American chestnuts, and beech scale/Nectria complex destroyed a large part of the beech resource. Eastern spruce bark beetle killed many already weakened spruce trees. Birch casebearer and bronze birch borer caused serious losses of yellow and white birch.

Subsequently, the activities and responsibilities of the Maine Forest Service's Entomology Division increased. The State began rearing and releasing parasitoids to attack birch leaf miner, bronze birch borer, European spruce sawfly, balsam wooly aphid, spruce budworm, gypsy moth, elm bark beetle, larch sawfly, and forest tent caterpillar. The program met with success against

some insects such as European spruce sawfly. In other programs, for example balsam wooly aphid and gypsy moth, biological control efforts failed.

Spruce Budworm Epidemic

The upsetting of the natural balance in our forests due to cutting, fire and insects has brought about large areas of relatively pure stands of timber, containing only a few species of trees, which are very susceptible to insect attack.

Albert Nutting
***Twenty-Eighth Biennial Report of the Forest Commissioner*, 1949-50**

In the late 1940's, spruce budworm again invaded the northern spruce-fir forest. The outbreak began in Canada, in the vast forests of Quebec and Ontario and spread into Maine as budworm moths in flight did not respect international borders. Gypsy moth also reappeared shortly thereafter. The federal government, through the Forest Pest Control Act of 1949, declared its intent to "prevent, retard, control, suppress or eradicate incipient, potential, or emergency outbreaks of destructive insects and diseases on, or threatening, all forest lands" (16 USCA §591-1 et seq). All parties involved in the budworm problem, though, were not in general agreement on which strategies to employ against outbreaks. Some saw long-term silvicultural techniques as the answer; others advocated insecticide use.

Modelling the offensive against spruce budworm after its successful fire control effort, the State set out to reduce the enemy population. For control efforts, a hypothesis evolved: if left unchecked, spruce budworm would destroy an entire industry, an industry which had changed dramatically since the previous budworm outbreak. This time the demand, especially for pulp and paper, was much greater, thereby placing far more value upon the supply. Furthermore, fir which had been little utilized before, was now valued highly because of its shorter fiber and consequent improved inking qualities. Because budworms would not honor boundary lines, every landowner's property was in jeopardy. An emergency existed and the State needed to respond...

DDT Comes and Goes

Landowners and the State now had powerful weapons in the form of insecticides which were quick, efficient, and very successful. Technology had advanced during World War II. Surplus military aircraft were easily adapted to carrying insecticides enabling the battle against insects to be waged from the air. The State consulted with Quebec and New Brunswick, which were already conducting aerial spray programs of their own, on the refined techniques of spray application. A spruce budworm spray program was conducted in Maine in 1954; gypsy moth was sprayed in 1954 and 1955. The chemical used was a chlorinated hydrocarbon, Dichlorodiphenyltrichloroethane — DDT. Over the next 13 years, DDT was sprayed to control spruce budworm during six spray projects.

Meanwhile, during the 1950's, Dutch elm disease left many tree-lined city streets denuded and numerous lawns without their beloved shade trees. But spruce budworm continued to gain notoriety. Increasingly, efforts of the Maine Forest Service's Entomology Division centered largely on this pest.

The federal government also began to play a more significant role in insect suppression as Table D demonstrates. Prior to 1954, the federal government did not assist financially in spruce budworm suppression but, as the problem worsened, the federal government contributed increasingly to the aerial spray effort.

Through the 1960's, the goal was to control the budworm population. DDT was successful, but scientific research revealed that it was too successful. DDT accumulated in the fatty tissues of many other organisms higher in the food chain; it was extremely toxic to fish, particularly fingerling salmon and trout, and interfered with the reproductive capacity of birds, especially birds of prey such as eagles, ospreys, and hawks. Evidence amassed on DDT's presence in all organisms tested. Citizens strongly protested the continued use of the chemical; the product was voluntarily banned in Maine in 1967 by the Forest Commissioner. After the ban, and with financial help from the federal government, the search began for similarly effective insecticides which were not harmful to the environment. Sumithion®, Dylox®, Orthene®, Zectran®, Matacil®, and Sevin-4-Oil® became common lingo. The first three insecticides are classified chemically as organophosphates, the latter three are carbamates. All of these insecticides act in the same way — they inhibit acetylcholinesterase, an enzyme which prevents continuous

Table D

Maine Spruce Budworm Financial History 1965-1983

YEAR	PRIVATE DOLLARS	STATE DOLLARS	FEDERAL DOLLARS	TOTAL DOLLARS
1954	10,045 (44)	5,482 (24)	7,314 (32)	22,841
1958	88,054 (37)	88,270 (37)	58,612 (26)	234,936
1960	71,834 (37)	71,750 (37)	47,750 (26)	191,334
1961	23,189 (37)	23,308 (37)	15,459 (26)	61,956
1963	179,805 (37)	183,552 (38)	125,777 (25)	489,134
1964	28,018 (36)	28,017 (36)	21,667 (28)	77,702
1967	35,953 (30)	35,953 (30)	45,955 (40)	117,861
1970	84,263 (31)	80,926 (30)	105,119 (29)	270,308
1972	385,943 (29)	385,943 (29)	538,001 (42)	1,309,887
1973	360,000 (30)	228,748 (20)	588,745 (50)	1,177,493
1974	360,000 (36)	143,078 (14)	503,078 (50)	1,006,156
1975	2,361,372 (38)	745,696 (12)	3,107,068 (50)	6,214,136
1976	3,964,590 (46.5)	298,410 (3.5)	4,263,000 (50)	8,526,000
1977	1,865,055 (61.5)	77,286 (2.5)	1,092,000 (36)	3,034,341*
1978	2,211,120 (59.2)	179,280 (4.2)	1,344,600 (36)	3,735,000
1979	6,600,000 (60)	400,000 (3.6)	4,000,000 (36.4)	11,000,000
1980	6,424,000 (77.6)	398,600*(4.8)	1,460,700 (17.6)	8,823,200
1981	5,469,472 (68)	348,000*(4.3)	2,232,940 (27.7)	8,050,412
1982	6,934,056 (85)	36,199*(1)	1,171,750 (14)	8,141,005
1983	5,656,395	108,596*(1.8)	98,000** (1.7)	5,862,991
TOTAL	42,503,767	6,720,494	17,151,078	66,374,339

( ) Indicates Percent of Total Project Costs

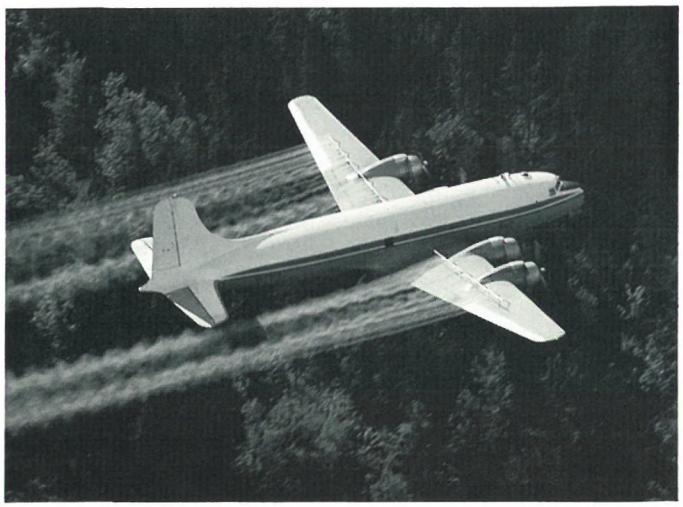
* General Fund dollars used for the Spruce Budworm Woodlot Management Program and the Forest Management Research Silvicultural Programs.

** Federal funds used for Spruce Budworm Woodlot Management Program only

SOURCE: Maine Forest Service

transmission of nerve impulses. Simply stated, these chemical insecticides are nerve poisons which kill organisms on contact or through ingestion by interfering with the working of the central nervous system.

Although their killing mechanism is the same, the crucial difference between DDT and the other insecticides was DDT's tendency to accumulate in fatty tissues. In addition, DDT persisted in the environment for a long time, whereas the other insecticides break down relatively quickly. Furthermore, DDT was applied at significantly higher dosages than later insecticides, and evidence suggested that some insects were developing resistance.



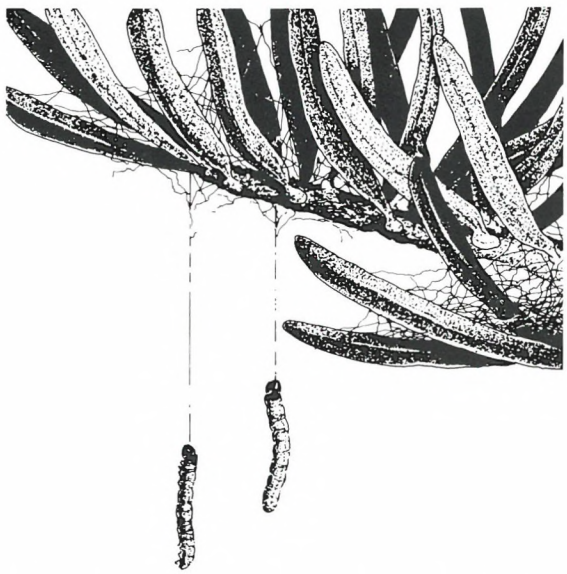
The Worsening Budworm Problem

By the 1970's, the budworm problem had worsened. Landowners relied heavily on the State aerial insecticide spray program. Since the State and federal government subsidized the spray projects, little incentive developed for landowners to devise other techniques to control the budworm. Moreover, because the State had always been responsible for budworm, "the landowners had never developed their own capability for budworm management."[1] Many landowners, however, felt the State, in its responsibilities, had not demonstrated long-range planning to protect the forest. State officials responding to public criticism, began to question the practice of subsidizing spraying of private land using public funds. The question became: What should the State's role be? Some believed that "the forests belong to everyone and thus the cost of their protection should be shared between private and public interests,"[2] while others felt that if the state continued to give subsidies to large companies, then the State should also have a voice in how private land was managed. The controversy was augmented by the actions of the federal government. The U.S. Forest Service had become disgruntled with contributing more than it felt its financial share should be and began to decrease funds. But the spray projects were getting no smaller, nor were the costs.

Seeing little progress being made in the dispute, two individuals and the Natural Resources Council, one of Maine's most prominent environmental groups, filed a

lawsuit in June 1975, in an attempt to block that year's spray project. The U.S. District Court denied the law suit.

Realizing that spraying was not solving the budworm problem and faced with growing public opposition to the now annual projects, the Legislature took a hard look. They directed the Natural Resources Committee to study the problem. Its report to the Legislature in 1975, stated that: "No progress has been made to bring the spruce budworm under control. Short of natural control of the budworm population, i.e. unfavorable weather or loss of food source, reasonably anticipated costs of protection and State financed participation will increase in the foreseeable future."[3]



The Natural Resources Council and Maine Audubon Society, another of Maine's influential environmental groups, testified before the committee, emphasizing "the need for long-range planning, formal cooperation with Canadian officials, greatly extended research efforts and financial support for the programs by the primary beneficiaries, the landowners."[4]

As a result the Spruce Budworm Suppression Act (12 MRSA C. 803 sub-C. IV) was enacted in 1976. The new Act recognized budworm as a long-term problem, recognized that landowners should assume a greater burden of the cost of insecticide application and recognized the need for environmental monitoring and human health research. A separate unit within the Maine Forest Service was mandated to plan for budworm suppression and to implement environmental monitoring and human health research. The strategy of population control was abandoned and replaced by a strategy to save the trees so that there could be orderly, timely harvest. A biological insecticide, *Bacillus thuringiensis* (Bt), which is specific to moth and butterfly larvae, came into use for a portion of each spray project.

Maine began to participate in the U.S. Forest Service/ Canadian Department of the Environment joint venture known as CANUSA (Canada-United States Spruce Budworm Program) in 1977. Funded for six years, CANUSA stressed research on techniques to reduce damage to budworm susceptible stands, improvement of methods to evaluate the impact of budworm, and information exchange.

But controversy and concern about spray projects continued. Health issues arose as Matacil was implicated in the incidence of Reyes Syndrome, a rare disease whose symptoms include brain and liver damage. Later, the claim was shown to be unfounded. Lawsuits, protests and petitions by groups such as PEST (Protect our Environment against Spray Toxins) attempted to bring the spray projects to their demise.

Annual wearisome battles with the U.S. Forest Service over funding ensued, with the Maine Forest Service planning spray operations without being certain of federal contributions or of federal insect and disease control policies.

New Courses of Action

In 1979, the Department of Conservation requested study on spray alternatives. The resultant report **Study of Alternatives to State Management of Spruce Budworm Spraying** concluded that a private entity could assume the operational aspects of the suppression program "without reducing the effectiveness of regulatory control over the program."[5] Further, it recommended that the State might retain responsibility for population surveys, damage assessment, and determination of areas in need of spraying.

Also in 1979, a Budworm Policy Review Committee comprised of representatives from forest industry, environmental groups, the University, State and federal agencies and the State Legislature recommended changes in the law, leading to the Spruce Budworm Management Act (12 MRSA C. 803 sub-C IVA) "State contributions to spray project costs were eliminated and replaced by commitments to research, insect survey and detection, and assistance to small woodlot owners. State funds were also committed to a thorough analysis of future spruce-fir supply and demand and to determine how much protection was required to insure further spruce-fir supply."[6] Landowners' participation in spray projects became voluntary; no longer was there an area designated to always receive spray treatment, with certain exceptions, as there had been in the past.

The Maine Forest Service and landowners began to refine each spray program. Areas of infestation and areas to receive treatment were mapped in greater detail. Recognizing public concern for risks to human health and to the environment, the Maine Forest Service established its own operating guidelines for spray application, exceeding those of the U.S. Environmental Protection Agency (EPA). Spraying became more targeted.

Environmental impact statements had been written for Maine spray programs since the National Environmental Policy Act was passed in 1969; none of the documents had had a sufficiently long-range focus. In 1981, the U.S. Forest Service and the Maine Forest Service cooperatively prepared a Programmatic Environmental Impact Statement as a five-year joint course of action. The commitment to an "increase in silviculture and utilization-marketing, while the use of chemicals is *reduced* and the use of biologicals is *increased*"[7] continues to serve as a declaration of the Maine Forest Service's position on spruce budworm suppression.

Pesticide Control and Monitoring

The Maine Board of Pesticides Control (BPC) began to assert its regulatory role in the conduct of spray projects. They adopted many of the Maine Forest Service's guidelines, and became responsible for certifying pesticide applicators, registering pesticides, monitoring use of pesticides and assessing their environmental impact.

Monitoring of lakes and ponds is a responsibility of the Department of Environmental Protection (DEP). As is noted in the Department's Water Quality Plan, "the contamination of surface waters...by aerially-applied insecticides (is one of the) most significant types of non-point water pollution associated with the forest industry in Maine."[8]

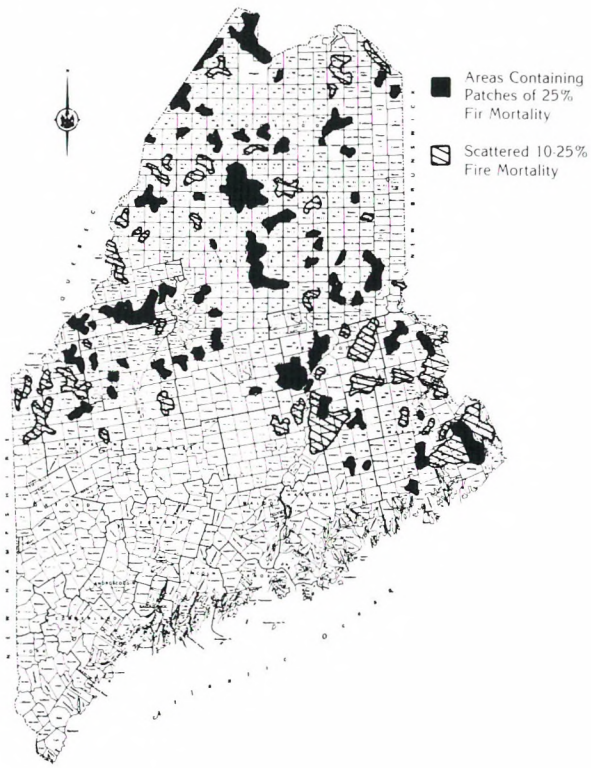
Research and environmental monitoring supported by the Maine Forest Service have concentrated on the effects of insecticides on aquatic invertebrates, insect pollinators, birds, fish, and amphibians. Other studies have focused on the biology and life cycle of the budworm itself, field tests of various insecticides, alternate methods of control, and markets for budworm-damaged timber.

Questions still unanswered include: What are the effects of insecticides on soil organic matter? on lake and river bottom sediments? in combination with other pesticides and/or acid rain? What are the insecticide breakdown products? Are new compounds formed with soil components when insecticides break down? To what extent are insecticides absorbed into plant tissues? What are the effects of repeated spraying on the environment? What would be the effects of no spray application?

The Budworm is Here to Stay

Landowners have become resigned to using other methods to deal with the seemingly never-ending budworm problem. Presently, the emphasis is upon integrated pest management, an approach promoted by the Maine Forest Service and the U.S. Forest Service. Faced with minimal State and declining federal financial assistance, little public support, and a projected shortage of spruce and fir trees in 20-30 years, landowners have few choices. In 1983 they were confronted with over 300,000 acres of dead fir (Figure 14); 5.5

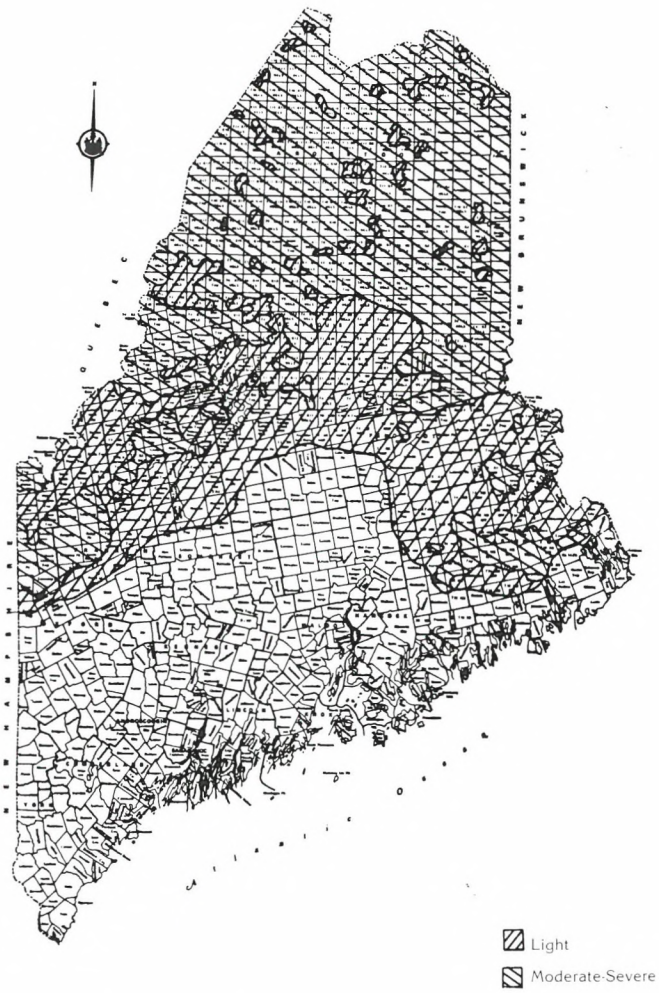
Figure 14
Damage by Spruce Budworm, 1983



SOURCE: Maine Forest Service

million acres of trees at severe to heavy risk (Figure 15); and more than 42 million dollars of private money already invested (Table D). Landowners have begun to concentrate on salvaging dead and dying trees and to cut susceptible spruce and fir species more heavily. They are also turning to other species such as hemlock and poplar and are replanting less vulnerable species such as larch. However, budworm-resistant species may

Figure 15
Defoliation of Spruce and Fir Due to Spruce Budworm, 1983



SOURCE: Maine Forest Service

be susceptible to other destructive insects or diseases, as in the case of larch by European larch canker, eastern larch beetle, larch case-bearer and larch sawfly.

Compounding the problem further are secondary insects and diseases. The Eastern spruce beetle, the shoestring root rot fungus, and species of heart and sap rot fungi are all opportunistic and invade trees already weakened due to environmental conditions or previous insect or disease damage. Being particularily vulernable to discoloration and decay which renders them unmarketable, dead trees generally must be salvaged within two or three years. Landowners have accelerated budworm salvaging, but the requisite road construction and harvesting operations can lead to increased soil erosion, stream sedimentation, and soil compaction. Furthermore, acres of dead and dying trees have created a tremendous fire hazard (See page 33-34).

Presently, markets for damaged trees are the same as for healthy spruce and fir — sawlogs, pulp, and wood chips for energy production. Research in and exploration for markets for salvaged wood must be expanded. As one approach, the Maine Forest Service has designed a study in cooperation with the U.S. Forest Service to determine the feasibility of pelletizing such trees for use as an energy source.

Economically, spruce and fir are vital to the State. In 1981, three-fifths of all wood cut in Maine was used for pulpwood. Of that amount, 53 percent was spruce and fir. More than three-fifths (62 percent) of all timber cut in 1981 was spruce and fir. Yet a spruce-fir wood supply/demand analysis by James W. Sewall Company of Old Town indicates that with current levels of harvesting, even if lands continue to be protected by spraying, a future shortfall of supply is likely.

To assure a continuous supply of trees, today's decisions must be in the best interest of future generations. Improvements in mapping, computer data storage and dissemination, survey and assessment techniques and research in genetically superior trees are aiding the process. Still to be determined is whether in the long term, capital invested in protection measures might better be invested in other measures to deal with the budworm problem. Investments in the use of alternative species, in improved utilization strategies, and in intensive forest management might prove to be more effective strategies in the long run.

As is obvious during the course of the present outbreak, spruce budworm has commanded an inordinate amount of time, effort and expense for the Maine Forest Service. The next logical step in the evolutionary process of managing the budworm is to incorporate pest management techniques with total forest management strategies, with foresters and land managers working cooperatively with forest entomologists and pathologists. Furthermore, a definitive insect suppression policy must be developed. And a cooperatively agreed upon definition of integrated pest management must be fundamental to all of the Maine Forest Service's forest insect and disease programs.

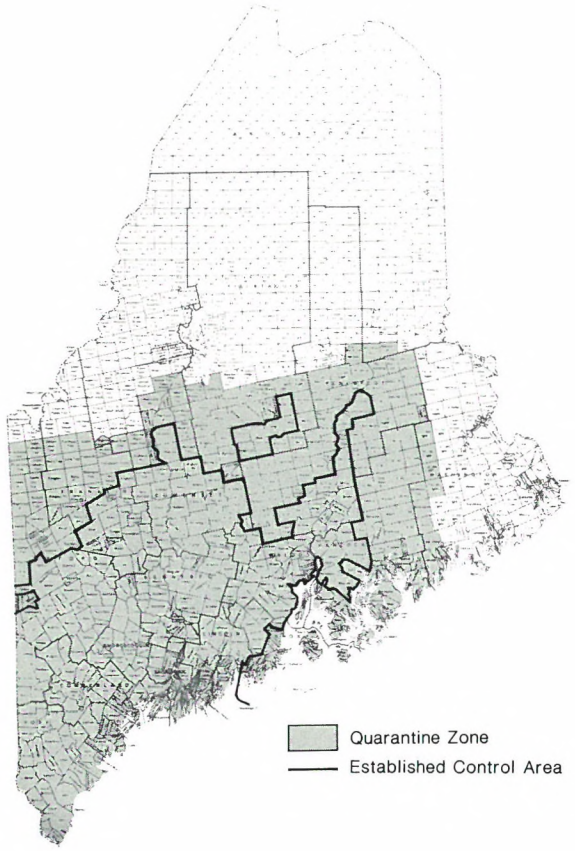
The picture here is of a biological system, including the budworm and its host forest functioning in a manner uniquely suited to the perpetuation of both insect and forest. Outbreaks and tree mortality are perfectly natural and normal phenomena and have occurred periodically over a long period of time certainly predating European man. They are not new.

"Report of the Task Force for Evaluation of Budworm Control Alternatives", 1976.

Pests of the '80's

The 1980's find the most prominent disease to be the white pine blister rust which continues to plague white pine (Figure 16). About 916,000 acres of commercial white pine growth were kept under surveillance in 1984. Susceptible pine stands are scouted in search of currant and gooseberry bushes, commonly termed *Ribes*, which serve as alternate hosts with white pine for the disease. When found, concentrations of *Ribes* are mapped to provide information for landowners or town officials who are responsible for the cost of control projects. Scattered individual plants are destroyed by blister rust surveyors of the Maine Forest Service Division of Entomology.

Figure 16
White Pine Blister Rust Control Area



SOURCE: Maine Forest Service

In 1983 European larch canker was found in coastal larch stands. National concern led to establishment of a quarantine area while evaluation of this exotic disease continues.

Although the spruce budworm is still the major insect problem with two million acres moderately to severely defoliated in 1984, other insects also harm the forest. White pine weevil continues to severely impact the white pine resource of the State.

Gypsy moth populations rebounded in the 1970's and peaked in 1981, defoliating 655,800 acres of hardwoods and occasionally pines and hemlock in southern Maine. An aerial spray program was conducted by the Maine Forest Service in 1982 on 2000 acres using *Bt*. The project was funded on the local level by those receiving the spray, with the federal government aiding in cost-sharing. Preliminary 1984 fall surveys show the outbreak to have subsided from virus and starvation.

Don't Panic

It is distressing to watch thousands of caterpillars marching up the side of one's home, to listen to caterpillars chomping an entire forest, or to see, in the spring, every leaf missing from a favorite backyard oak. The pest problem becomes more enraging as chemical insecticide company commercials transform the pests into horrid monsters which must be obliterated. Nevertheless, the situation must be put into perspective.

Hardwood trees generally survive defoliation. Because they produce more food than they actually need for sustenance and growth, they establish a reserve of food energy. However, when the tree must tap its reserve to produce a second set of leaves, a deficiency is created in the tree's ability to "maintain itself during the dormant winter months and to produce buds and twigs in early spring."[9] Although the tree may suffer growth loss, it can recover. Generally, only if defoliation occurs for three or more years does a real problem arise. The tree becomes stressed, and is thus vulnerable to secondary insect and disease attack. So far, the full significance of tree damage and mortality caused by such insects as gypsy moth or forest tent caterpillar has not been determined.

Often there are simple means to rid trees of unwanted pests. Through personal visits, group presentations, and printed literature, the Maine Forest Service's Entomology Division seeks to provide citizens with an understanding of the pest, the methods of control, and the possible consequences of those methods. In addition, the Cooperative Extension Service of the U.S. Department of Agriculture provides information and education similar to the Maine Forest Service.

The emergence of many pests, such as gypsy moth larvae, coincides with the beginning of the summer recreation season. Their presence can be most unpleasant. But, according to the Maine Publicity Bureau, "the effect upon tourism is minimal." Although some insects pose no clear economic or long term danger to the hardwood forest of Maine, when their numbers increase dramatically, citizens react. They want someone to "do something." In times of fiscal constraint, however, it is necessary for government, whether federal, state, or local to carefully weigh the cost of control measures, such as aerial insecticide spraying, against benefits, with attention given to potential environmental and human

health concerns. Furthermore, the distinction must be made as to whether the insect poses a serious economic threat to the forest or is merely a nuisance.

Learning More About Pests

1. Powers and duties. The Director of the Bureau of Forestry shall maintain sufficient resources, both personnel and technical information, within the limit of funds available, so as to:

A. Maintain a statewide surveillance system to detect insects and diseases potentially injurious to the forest resources of the State.

B. Provide information and technical advice and assistance to individuals and other state and federal agencies on the identification and control of forest insects and diseases.

C. Conduct and supervise control programs for forest diseases and insects where authorized.

12 MRSA §8101 Forest Insect and Disease Control Program

Charged with primary control of forest insects and diseases, the Maine Forest Service responds to outbreaks as they occur, with control measures dependent on the specific entomological or pathological problems. Predicting outbreaks then, has become an essential component of the service provided by the Maine Forest Service entomological staff. Whether by examining the catch from a light trap designed to attract moths; or meticulously inspecting substrate traps, such as logs for beetles, or representative branches for species of insects; or carrying out aerial or ground observations for mapping of damage to host trees, entomologists routinely conduct surveys to keep apprised of insect and disease population fluctuations. The results are compared with past years, and with what is happening in surrounding areas to determine trends and make predictions.

When the general trend shows that increases in population or other problems may be arising, more specific surveys and assessments are conducted. Survey techniques will continue to improve as knowledge is added about the life cycle of particular insects.

Presently, there is a lack of detailed economic impact information. Just how much loss is the State sustaining? Improved economic information would aid in the choice of the best pest management techniques.

To aid in the programs of the Maine Forest Service, the U.S. Forest Service, through Section 5 of the Cooperative Forestry Assistance Act of 1978 (16 USC 2101) provides financial-technical assistance in prevention, detection, evaluation and suppression of forest pests. Of the total federal money the Maine Forest Servicereceived in 1984, 13.7 percent was designated for insect and disease control.

The U.S. Forest Service also conducts research in entomology, as does the University of Maine, but again spruce budworm has commanded center stage. Research has examined possible alternatives to chemical inecticides such as use of moth sex attractants (pheromones), chemicals to prevent maturity of and sterilize members of the insect pest populations, rearing of parasites and predators, and development of insect-resistant tree species. Biological insecticides have also been examined.

As more nurseries, plantations and seed orchards are developed, the need for monitoring insect and disease populations becomes greater. When a species of trees is concentrated in an area rather than individuals being scattered throughout mixed growth, insects and diseases have full banquets laid out before them. Their populations, thriving on an overabundance of food, can increase rapidly. Christmas tree plantations are one example. Balsam gall midge, balsam twig aphid and spruce gall all infest Christmas tree plantations but are not considered serious problems in the forest. By recognizing potential outbreaks before they become actualities, we may be able to act to prevent or at least minimize their occurrences.

What needs to be emphasized, however, is that most insects and diseases are natural elements of the forest. When the forest is managed to ensure its health and vigor, insect and disease damage is minimized.

Only by taking account of such life forces (living populations and all their pressures and counterpressures, their surges and recessions) and by cautiously seeking to guide them into channels favorable to ourselves can we hope to achieve a reasonable accommodation between the insect hordes and ourselves.

— Rachel Carson
***Silent Spring*, 1962**

Identified Needs for Action Related To Forest Insect and Disease Management

Certain forest insects and diseases have the potential for significantly damaging the forest. Understanding the life cycle, niche, and potential impact of the particular forest insect or disease is of extreme importance in making decisions on control measures. The diverse values and demands placed upon the forest must also be recognized.

The following represents needs which have been identified in Chapter Two, Section C. These needs are translated into Actions to be Taken in the **Action Plan** beginning on page 108. The **Action Plan** contains detailed work of the Divisions of the Maine Forest Service. The Actions found in the **Action Plan** may address more than one need as expressed in this section and other sections of this Chapter.

Needs For Action:

Education

- Provide the general public with information on identification and potential destructiveness of certain forest insects and diseases as well as control measures which are available and their effects.

Education and Fire Management

- Provide the general public with information on the fire hazard created by spruce budworm-damaged and killed trees.

Entomology

- Define "integrated pest management" and develop specific land management strategies accordingly.
- Conduct spray programs and impose quarantines as necessary that prevent or restrict the spread of insects and diseases.
- Provide survey data on the impact of insect and disease populations. Determine which surveys will provide the most valuable information. Expand surveys to include economic impacts.

Administration

- Develop policies on management of the spruce budworm outbreak to reflect the spruce-fir supply and demand situation.
- Provide assistance to landowners on major insect and disease management strategies.

Research

- Encourage research on effects of insect and disease suppression programs on water quality and quantity, soil, recreation and wildlife.
- Promote the development of forest insect and disease resistant strains of tree species to help lessen future insect and disease outbreaks.

Timber Management & Wildlife

- Provide technical assistance to landowners in salvaging spruce budworm damaged and destroyed timber.

Planning

- Computerize forest insect and disease information to help provide a more complete picture of the entomological and pathological problems in Maine's forest. Expand use of the computer mapping system to provide more accuracy and efficiency in determining population trends.

Footnotes — Chapter Two — Section C

[1] Rumpf, Thomas, Lloyd Irland and Stephen Blackmer, "Spruce Budworm Policy in Maine: Tradition, Conflict, and Adaptation" **Journal of Forestry,** November, 1982, p. 709.
[2] Wilkins, Austin, **Ten Million Acres of Timber: The Remarkable Story of Forest Protection in the Maine Forestry District,** (Woolwich, Maine: TBW Books, 1908), p. 201.
[3] "Report of the Committee on Natural Resources on its Study of the Spruce Budworm Problem in Maine," January, 1975, p. 3.
[4] Ibid., p. 13.
[5] **Study of Alternatives to State Management of Spruce Budworm Spraying,** prepared for Maine Department of Conservation by Lund, Wilk, Scott, and Goodall, Augusta, September, 1979, p. v.
[6] Rumpf, Irland and Blackmer, p. 710.
[7] **Final Programmatic Environmental Impact Statement: Proposed Cooperative Five Year (1981-85) Spruce Budworm Management Program in Maine,** U.S. Department of Agriculture-Forest Service, 1981, p. viii.
[8] **State of Maine Water Quality Management Plan,** p. 23.
[9] "The Homeowner and the Gypsy Moth: Guidelines for Control," USDA Combined Forest Pest Research and Development Program, Home and Garden Bulletin 227, p. 21.

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CHAPTER TWO—Section D

Humans in the Forest

It be the policy goal of the State of Maine to make use of its forests by assigning high priority to the best management of its forest resources.

— Commission on Maine's Future
December, 1977

It takes years for a tree to grow and only minutes to cut it down. Undeniably, the greatest impact upon the forest is human. Whether the choice is to plant trees, nurture them, or use them for personal benefit, the impact is felt. Whether the forest is wisely tended or consumed with reckless abandon, generations to come will reap the harvest of those actions. Decisions made now will determine if the harvest is bountiful or if it is scant.

Trees are the *élan vital* of the State of Maine — its recreation, its home for wildlife, its harbor for water, the very essence of its economy. Forty-five percent of Maine's communities have some form of forest industry. The way in which the forest is treated is a reflection of the value placed upon it, the pride bestowed on it.

Forest Land Ownership

Who Owns the Land?

The Great Chief in Washington sends word that he wishes to buy our land. How can you buy or sell the sky — the warmth of the land? The idea is strange to us. Yet, we do not own the freshness of the air or the sparkle of the water. How can you buy them from us? Every part of this earth is sacred to my people.

Chief Sealth of the
Duwanish Tribe, 1855

In Maine, forests cover a greater percentage of land than in any other state. Overall, nine out of every ten acres is covered with trees. Eighty-seven percent of the total land base, 17.2 million acres, is *timberland*, land capable of producing wood for industrial use.

Approximately 94 percent (Figure 17) of the timberland in Maine is privately owned with 67 acres being the average ownership parcel size. For the most part, human activities upon that land are private decisions. The remaining 6 percent, 1,037,000 acres, of the timberland is owned publicly by municipal, state and federal governments. A portion of the productive forestland is held in public reserve in such tracts as Acadia National Park and Baxter State Park. There are also scattered parcels of forestland owned by private, nonprofit organizations such as the National Audubon Society, Maine Audubon Society and the Nature Conservancy.

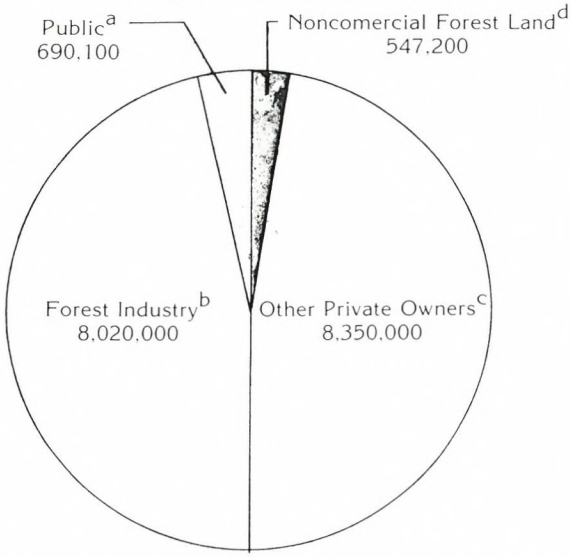
Included in the classification of publicly owned lands are 230,000 acres belonging to the Passamaquoddy Tribe, the Houlton Band of Maliseet Indians and the Penobscot Nation. These tribes were all members of the Etchemin Tribe dating back to pre-European settlement. In 1975, *Joint Tribal Council of the Passamaquoddy Tribe, et al v. Rogers C. B. Morton, et al*, was filed in federal court contending that the "State of Maine acquired or caused or permitted to be acquired, land from the Passamaquoddies and Penobscots without the approval of the United States as required by 25 U S C §177 (the "Non-Intercourse Act")."

Five years later, the tribes were granted $54 million as part of the Maine Indian Land Claims Settlement Act of 1980 (25 U.S.C. 1724). Part of the grant has been used for land acquisition, part for other investments, and the remainder placed in a trust fund. It is yet to be determined just how much autonomy the tribes have in decisions regarding management of their lands.

Industrial North — Non-Industrial South

Although ownership patterns change, basically the private forest of the State is divided equally between industrial (landowners with mills) and non-industrial (landowners with no mills) ownership. Even geographically, the distinction exists between the two. The land south and west of Bangor is held in title mostly by many non-industrial landowners. Being the more populated area,

Figure 17
Percent Ownership of Forest Land in Maine, 1982



a Includes national forest, other federal, State, Indian (trust and fee tribal lands), county and municipal

b Includes unincorporated forest industry

c Includes farmers; individuals, corporations and other private interests

d Includes productive reserved land (e.g. Acadia National Park and Baxter State Park—Scientific Forest Management Unit) and unproductive reserved forest land (e.g. Baxter State Park)

SOURCE: Forest Statistics for Maine 1971 and 1982

the southern half of Maine consists of many incorporated, self-governing, autonomous towns and cities — the Organized Territory.

North and east of Bangor, the so-called "wildlands" are owned for the most part by large pulp and paper companies or controlled by land management companies. With the exception of pockets of urbanization, this area, the Unorganized Territory, is sparsely settled and possesses few of the features of self-government. For much of the planning and zoning aspects of government, the Land Use Regulation Commission functions as the "Town Hall."

Plantations are enigmas in between organized and unorganized. They have sparse populations and limited self-government. Plantations are scattered throughout the State, but they commonly form the "border" between the organized and unorganized territories.

Industrial Forest Ownership

We think it a settled principle, growing out of the nature of a well-ordered society, that every holder of property, however absolute and unqualified may be his title, holds it under the implied liability that his use of it shall be so regulated that it shall not be injurious to the rights of the community.

Maine Supreme Court - 1908

Of the total acreage of 17.2 million acres, forest industries own 8 million acres — 47 percent — of Maine's (timberland). "Pulp and paper companies own about 93 percent of the industrial land, lumber companies own about 7 percent, and various other wood-using firms own less than 1 percent."[1]

Generally, forest industry owns large parcels of forestland and are often referred to as "major landowners." Table E lists the major private forest landowners. Included among the major landownerships are lands entrusted to land management companies which, although not allied with industry, manage lands so as to give the best return on investment.

Three million two hundred thousand acres of commercial forestland are represented by an ownership pattern unique in the world. As was discussed on page 2, much publicly owned land was deeded to private ownership during the early 1800's. At that time, land speculation and thus risk of ownership was high. To extend the risk, several individuals would jointly "purchase an unorganized township and hold it in common ownership and undivided interest. With this form of ownership, no division lines were drawn, and each of the owners held his personal undivided share of the total. Gains and losses from the ownership of the land were also shared according to each owner's interest in the total. Thus, if some of the timber on the township was harvested, each owner would receive his proportionate share of the proceeds even if all the timber were harvested from one part of the township. Conversely, if a fire, insect outbreak, or other natural catastrophe struck the township, each owner would share in the loss according to his proportional share."[2]

Table E
Maine's Largest Landowners/Land Managers 1984

Great Northern Paper Company	2,113,000
International Paper Company	1,095,000
Prentiss & Carlisle Company	975,000
Scott Paper Company	900,000
Seven Islands Land Company	883,000
Diamond International Corp.	801,000
Champion International Corp.	760,000
*State of Maine	670,000
Boise Cascade Corp.	605,100
Georgia-Pacific Corp.	520,000

*Acreage in Unorganized Territority only

SOURCE: Paper Industry Information Office; Department of Finance and Administration, Bureau of Taxation

Over generations, the land has passed to heirs in compounded ratios reflecting the original ownership ratio. Thus, it is not uncommon today to find an individual owning 155/1728th of a township. Decisions regarding the land are made by the land management company. Owners delegate this authority with the owners' interests weighted by the ratios. For the most part, the situation works well. Occasionally, problems arise. For example, because the "majority rules" in decisions, landowners are included in spruce budworm spray programs who may not have chosen to be. Another area of difficulty lies in land trades with the Bureau of Public Lands. As the Bureau strives to consolidate the State's landholdings, negotiations can be hindered by the complex ownership fractions.

Wood Products

Pulp and Paper

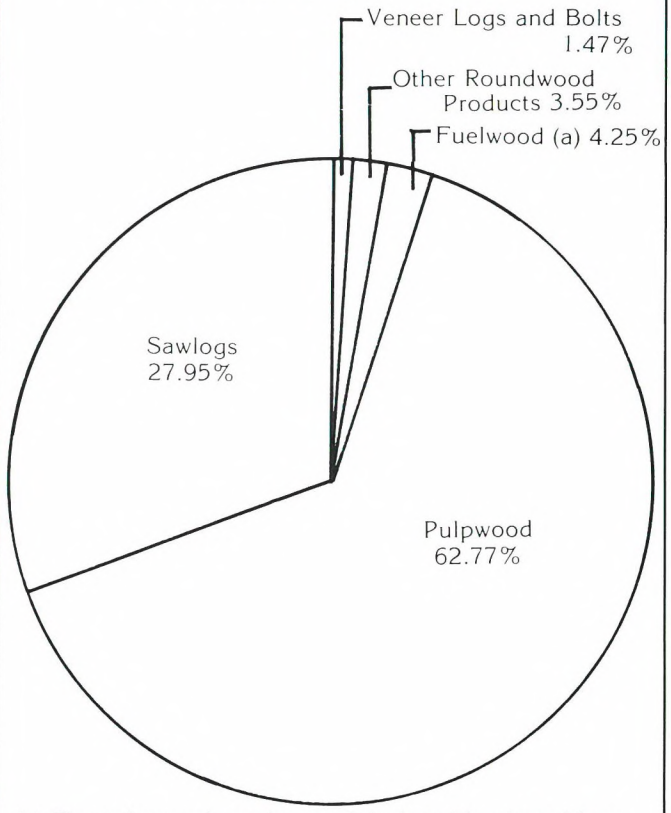
On much of the timberland, and certainly on the majority of the industrial portion, the forest is used for wood products (Figure 18). Of the products which industry creates from the forest, pulp and paper rank far ahead of all others. Eighteen companies in Maine make pulp, paper or both. Collectively, these companies own over seven million acres of timberland.

In 1981, 65 percent of timber cut was pulpwood. This wood translated into newsprint, magazine and catalog paper, envelopes, paper towels, business forms, egg cartons, at least fifty other paper products and even the boxes in which they are sometimes transported.

Thousands of tons of wood enter these mills every day. The actual number of course, depends on the demand at the time. Spruce and fir are the predominant species used. Although the exact process of making pulp and paper differs from mill to mill, basically the steps are similar (Figure 19).

As pulpwood enters a mill, its bark is removed. The debarked pieces are then chipped or ground and their fibers separated either chemically (by cooking in a huge pressure cooker known as a digester) or mechanically. Next the fibers are screened. If unbleached pulp is the desired outcome, the process can stop here. Or the pulp can be washed, bleached, rewashed, refined, drained, squeezed, pressed and baled as market pulp. Or it can continue and be heated, dried, and finally rolled into long sheets of paper. The process can be halted in places along the way as the particular product requires. For example, brown carbonizing tissue is an end product after unbleached wood pulp has been screened and processed.

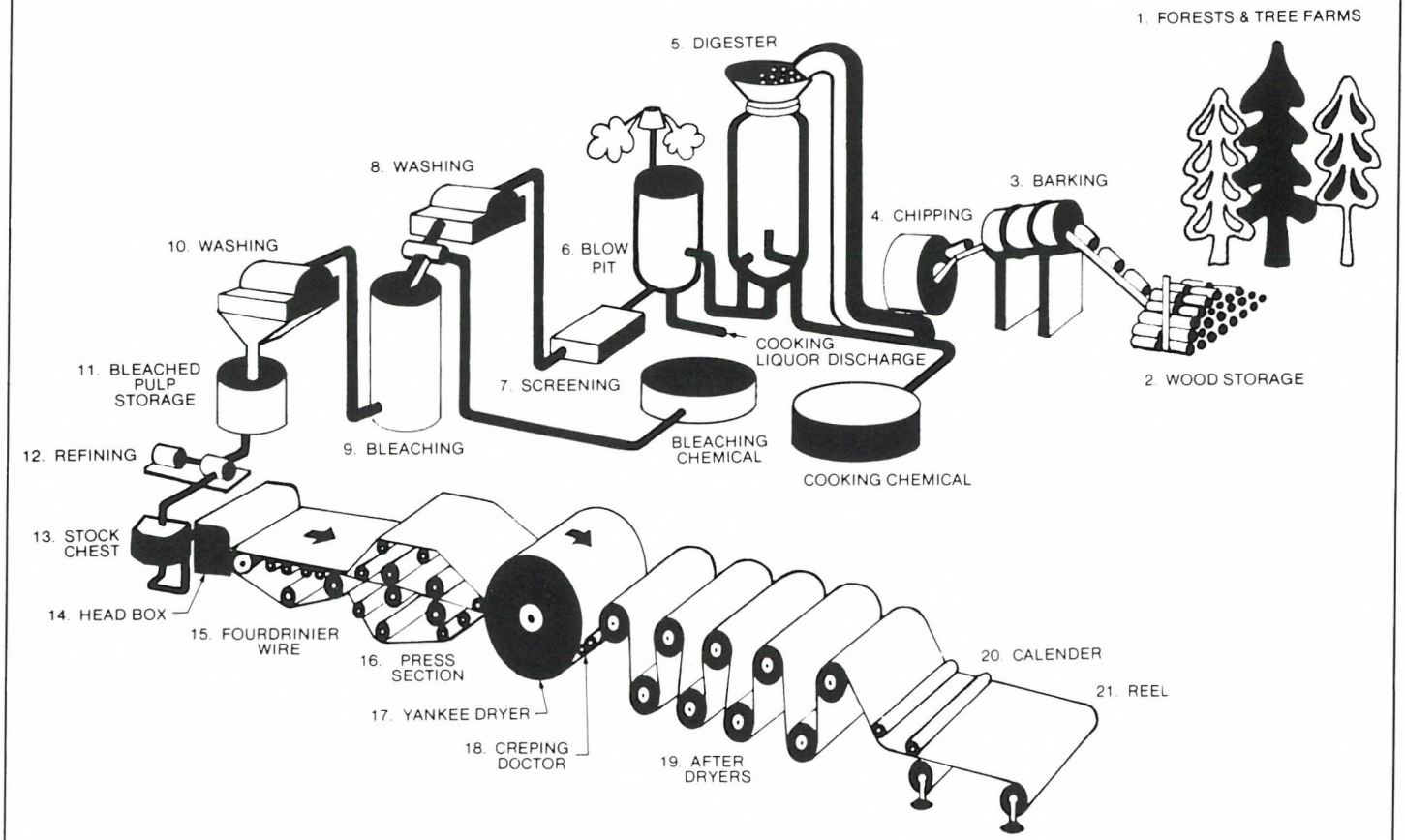
Figure 18
Percent of Timber Removals from Growing Stock on Maine's Commercial Forest Land, by Item, 1982



(a) The estimate of growing-stock fuelwood is adapted from *Comprehensive Energy Resources Plan*, Maine Office of Energy Resources

SOURCE: *Forest Statistics for Maine, 1971 and 1982*

Figure 19
A Paper Making Process



Used with permission of Scott Paper Company

In 1981, 2.8 million tons of pulp were produced in Maine mills. This pulp contributed to the making of paper products worth $2.7 billion. These products left Maine's mills destined to points within Maine, to other states and to many foreign countries.

More than 20,000 people in Maine look to the pulp and paper companies for jobs. Average salaries are higher here than any other manufacturing industry in the State. Levels in 1982 of $25,348 were $9,000 above the State manufacturing average of $16,334..

Over the years, the paper industry economy has followed the nation's economy, slumping when the national economy slumps and accelerating as the nation's economy prospers. But a "lag" time exists. Slumps in the paper industry trail the nation's slumps; likewise, so do recoveries.

Predictions are for the pulp and paper economy to continue to reflect the national economic trends. Decline in the production of pulp and paper in Maine could possibly result if plastics continue to substitute for packaging; if electronics, such as the use of computers reduce the demand for paper and if technology develops to convert Southern pine into high quality paper. On the other hand, it must be noted that nationally about 50 percent more pulp products are imported than are exported.

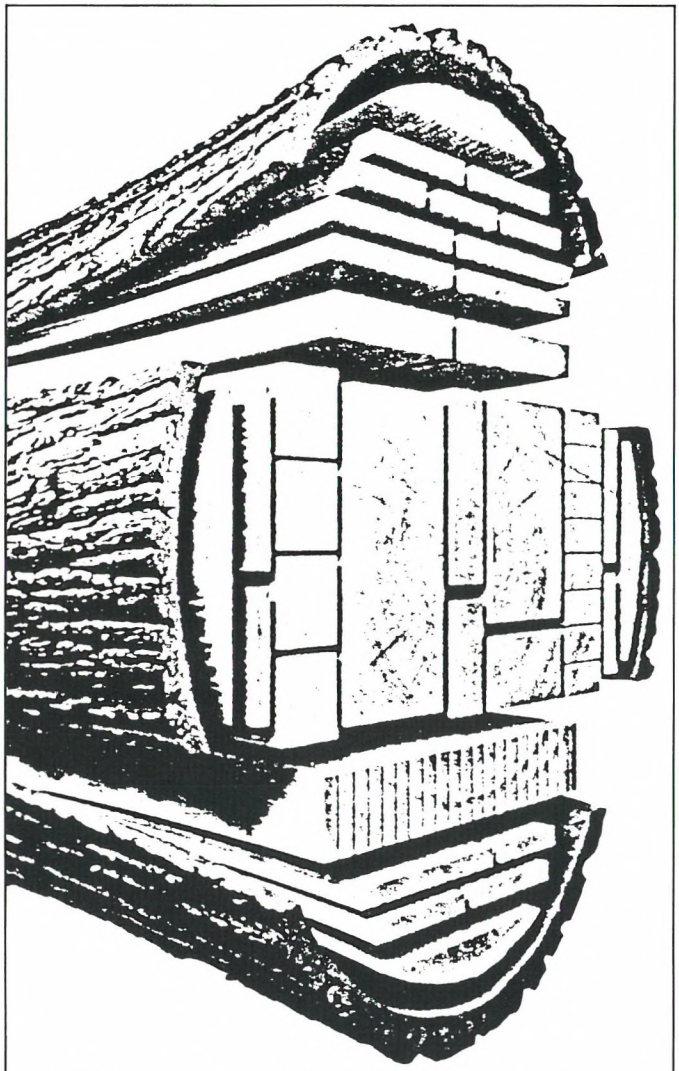
Sawn, Turned, and Peeled

Wood is universally beautiful to man. It is the most humanly intimate of all materials.

Frank Lloyd Wright
***The Architectural Record,* May 1928**

Five Maine pulp and paper companies, Georgia-Pacific Corporation, Great Northern Paper Company, Scott Paper Company, James River Corporation and

Champion International Corporation, have diversified into the second largest *wood* industry and the fourth largest *manufacturing* industry in Maine (Table F). These five and 389 other primary wood processors produce such items as lumber (boards, dimension sizes, timbers, beams, and posts), dowel flitches, turning squares,



Used with permission of Champion International Corporation

veneer, shingles, clapboards, and fencing material. Sawlogs, the raw material for lumber, are commonly worth two to five times their value as pulpwood.

Again, spruce and fir predominate, representing 52 percent of sawtimber cut in 1981. White pine, valued for finish work, comprised 20 percent. Demand for softwoods recognizes characteristics of strength, light weight, and ease of machining.

Hardwoods are less commonly used for wood products. Of all sawlogs cut in 1981, less than 151 million board feet or 16 percent of the total was hardwood. White birch, sugar maple and oak were the most common species utilized.

This industry directly responds to fluctuations in the home construction market. For example, when interest rates are high, building construction declines and the lumber industry slumps as well.

Trees cut in the woods and destined for sawmills become sawlogs for lumber, veneer logs and boltwood for a variety of specialty uses (Figure 20). Boltwood can be cut in the forest from crooked trees or large suitable branches, it may be resold to one of 38 wood-turning plants, or go to other secondary wood processors who manufacture such items as lobster traps, pallet stock and furniture squares.

Most superior logs cut from the forest are sent to veneer mills. Veneer logs command the highest prices of all raw wood material. There are two types of veneering. The most valuable veneer comes from clear butt logs of almost all hardwood species. In veneer mills, the steamed logs are turned in a huge lathe where a full width strip of wood is peeled from the log. Defective sections are removed. Once dried, the best pieces are used as face layers with the defective sections used beneath.

In flatware mills, veneer quality birch is used for such items as toothpicks and tongue depressors. Short sections of logs, called bolts, are steamed and then short knives peel a wide ribbon of wood from the bolt. The ribbon is rewound and fed through "choppers" which stamp out the desired product. In Maine, eleven mills produce veneer for stamped products. The best quality veneer is prized by the furniture industry. Yet, there is only one mill in the State which produces veneer of such high quality.

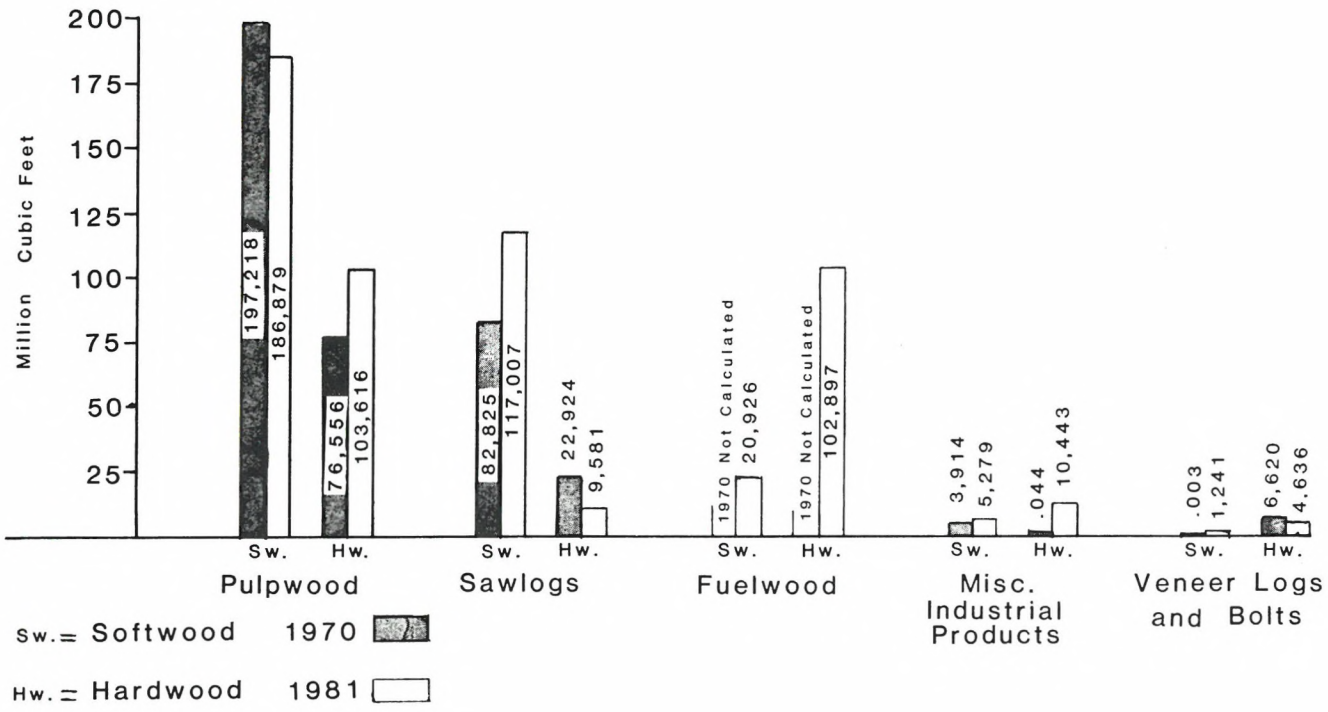
Table F

Major Manufacturing Industries in Maine and Value of Products, 1982

INDUSTRY	*Value of Product $ in Millions*	*% Change from 1981*	*% Change from 1977*
Paper	2,714.2	– 1.4	67.0
Leather	961.5	15.5	75.3
Food	743.5	0.6	53.7
Lumber & Wood	641.5	– 7.9	31.1
Transportation Equipment	697.6	24.8	234.7
Electric & Electronic Equipment	465.4	– 0.1	139.2

SOURCE: Census of Maine Manufactures, 1982

Figure 20
Output of Roundwood Products in Maine, Hardwoods and Softwoods, 1982



SOURCE: *Forest Statistics for Maine 1971 and 1982*

From Logs to Lumber

The process of converting round sawlogs into rectangular pieces of lumber begins with debarking; clean logs increase the period between saw sharpenings and also make the leftover chips suitable for paper making. In mills with the highest technology, a light beam scans the incoming log and determines within seconds how it should be cut to attain the most valuable products. "The debarked log is sawn at the headsaw into slabs (with one flat face) and flitches (live edge boards or cants with two parallel flat faces)."[3] The first cut is the most crucial cut of all; the value of all products coming from each log is determined here. "The slabs go to the chipper, where slabs, edgings, and trim ends may....be converted into pulp chips. The flitches (cants) proceed either through a resaw, or directly to an edger, which produces rectangular lumber by sawing off the rounded, tapered edges. Edgers use a fixed saw and a number of movable saws mounted on an arbor or shaft. The distance between the saws is adjusted for each flitch to obtain the width that provides the highest value. The rectangular boards are then fed past trim saws, which cut the pieces to (specified) lengths (including a small overlength allowance). The trim saws may also cut out major defects, producing two short boards."[4] The lumber is then antistain-treated, dried, retrimmed to length, planed, graded and finally packaged. In the most efficient mills, all of the log is used — bark, lumber, sawdust, slabs, edgings and trim ends (See Table G).

The Maine Forest Service conducts a Sawmill Improvement Program. Technical expertise is available to sawmill owners on all aspects of mill operations to achieve the best production through greatest efficiency. The program is designed to alert sawmill owners to specific problems in their individual mills. Prior to 1983 this program received financial assistance from the U.S. Forest Service; the assistance is now terminated.

Primary to Secondary Processing

Primary products leave processing mills headed as is to wholesale or retail markets. Primary wood products may also travel to secondary wood-processing mills located at a distance from or at the site of primary facilities. Here they may be converted to one of over 1400 different Maine-made items as diverse as toothpicks and schooners. Cabinets, doors, stairs, ladders, picture frames, and toys are but a few of the other products.

The wood-turning industry is included in this category. Even though many different products are created, wood-turning products have their method of manufacture in common: "all are turned on a lathe, which rotates the wood against a cutting blade."[5] Items such as napkin rings, clothespins, chair arms and legs, baseball bats and thread spools are all examples of products created by the wood-turning industry.

Veneer, from veneer logs, is another example of a wood product converted to secondary items. Layers of clear veneer are used as cover sheets between which less valuable wood is sandwiched for items such as kitchen cabinets, tables and desk tops.

Every county in the State has at least three secondary wood-using industries; Oxford County has over thirty. Sometimes the items are finished, as with clothespins; other items such as chair legs are only parts of more valuable products.

Together the wood/lumber and pulp/paper industries accounted for 43 percent of Maine's total manufacturing sales in 1982 (Figure 21). Wood products worth $3.3 billion left Maine's mills. One in every three workers employed in the manufacturing sector received a paycheck from one of Maine's wood products mills.

The Paper Industry Information Office located in Augusta provides information to the public, conducts public relations activities and serves as the spokesperson for the major pulp and paper industries.

The Maine Forest Products Council represents the forest products industry. Its efforts in legislative lobbying; organizing workshops, demonstrations, and field trips; and informing its members focus on promoting Maine forest products. The Council strives to improve public awareness of the economic and social value of forest products industries to the State.

Burning Wood Again

To the greatest extent possible, the State of Maine should come to rely on indigenous and renewable resources.
Office of Energy Resources
***Comprehensive Energy Resources Plan*, 1981**

In recent years, cutting, sale and use of wood for fuel has regained prominence. Where once wood provided heating needs for all residences and businesses, by the 1870's, coal began to take over. Sixty years later, oil, the cheap, easy, clean-burning fuel, replaced coal. By the late 1970's the cycle began to complete its full circle. Between 1978 and 1980, the price of a gallon of home heating oil went from 51 cents to more than $1.00. Since the average home burns 1100 gallons of oil a year, obviously homeowners rebelled against the high prices.

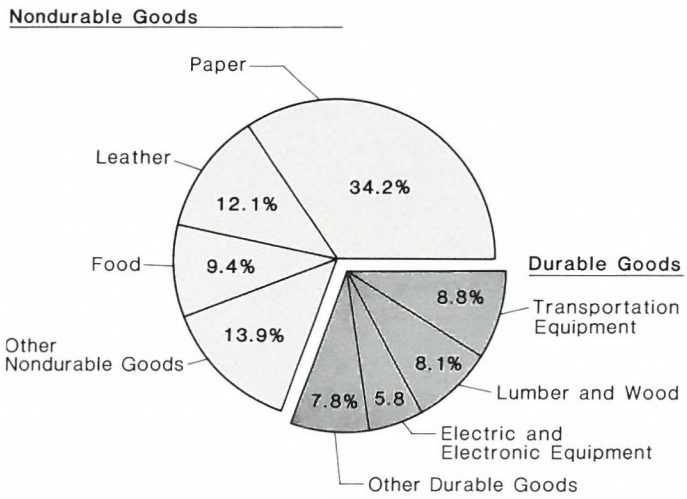
Table G
Mill Residue

SAWMILLS	
bark	sawmill trim
sawdust	planer trim
edgings	planer shavings
slabs	
PLYWOOD	
log trim	veneer clippings
bark	roundup & spur trim
cores	dry trim & lay up loss
sander dust	
SHAKE AND SHINGLE	
bark	shingle hair
bolt trim	edgings
slabs	

SOURCE: Maine Forest Service

As of 1982, half of all families in Maine used wood as either their sole heating source or as a supplement. Projections of the Office of Energy Resources (OER) show that by 1990, "75 percent of all Maine households will be heating totally or partially with solid fuel... Firewood, wood chips, and wood pellets will make up a substantial portion of this total."[6]

Figure 21
Percent Distribution of Maine Production Value, by Industry, 1982



SOURCE: Census of Maine Manufactures, 1982

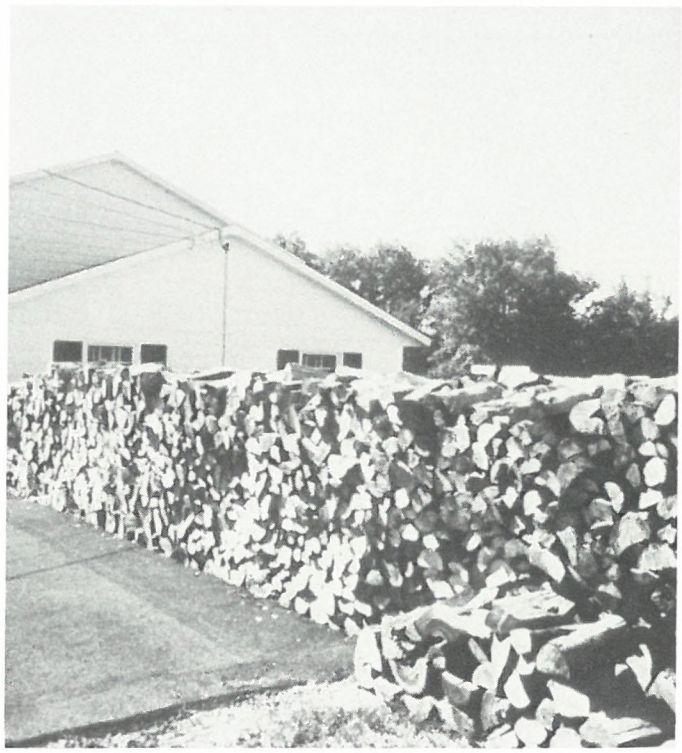
The Office of Energy Resources and the Maine Forest Service monitor firewood sale and use and provide information to businesses and homeowners on firewood and on wood burning systems. The Cooperative Extension Service provides educational materials on wood-burning and has conducted projects on the safety aspects of using wood for fuel. All of these entities recognize that wood burning has its disadvantages. Wood smoke can contain air pollutants some of which may be carcinogenic. Carbon monoxide, hydrocarbons, and nitrogen oxides are among the chemicals posing the most danger. In communities with high rates of wood burning and where air inversion occurs, the situation may be especially severe for the elderly, the very young and people with respiratory problems.

The Best Must Not Be Burned

In 1983, approximately 1.2 million cords of wood were cut for firewood. But little is known as to whether firewood is taken as part of a thinning operation or whether the best oaks and maples closest to the road are taken. In some cases, the remaining stand of trees is left in good shape. In other cases, the stand may be robbed of some of its most valuable trees, trees which could possibly have commanded a much higher price if taken to a sawmill. Thus, education as to the highest and best use of each tree is sorely needed. The market for firewood can be a real incentive to thin and weed a forest by removing low quality trees. The firewood market can also be the poorest use of the best trees.

To what extent given demand for lumber and veneer and particleboard and paper, for purity of watershed and diversity of wildlife, for public recreation and private amenity-given these, to what extent can people have their forest and burn it too?

John Mitchell
"Whither the Yankee Forest", 1981



Forest industry, too, has seen the value of fuelwood. Whole tree chippers have enabled industries to use insect- and disease-killed trees, slash from logging operations, and trees removed in thinning operations — all materials once considered useless — for fuel. Species such as pin cherry and grey birch, viewed previously as weeds, now command a price. The need for fuel has made thinning forest stands economical, and truly a commercial operation.

As long as whole tree chipping operations are carried out with consideration given the remaining stand of trees, then the concept allows for continued yield of the forest. But when large tracts of forested land are cleared and chipped (and not regenerated with desired species) and/or when high quality trees are reduced to chips, then more has been lost than gained.

Sawmills and pulp and paper companies now view their own sawdust piles, leftover bark and shavings as fuel rather than wastes (Table G).

Individual industries are each saving as much as 750,000 barrels of oil a year. Some companies burn wood waste only; other companies combine wood and coal, a mixture which burns cleaner than oil. Wood waste also heats kilns which dry lumber and other wood products. Steam from wood waste-fired boilers drives some mills' machinery. Some companies generate electricity from the steam and use it in their mills or sell it to utility companies. Great Northern Paper Company, S.D. Warren, Robbins Lumber Company, Inc., Sprowl Brothers Inc., P. H. Chadbourne and Company, Albert R. LaValley, Inc., Champion International Corporation and Georgia-Pacific Corporation are among the companies which now cogenerate. "The Office of Energy Resources estimates that there is a potential for a significant increase in cogeneration in Maine. Much of this potential is within the forest products industry."[7]

Paper mills, in addition, use spent pulping liquors, known as black liquor (a by-product when cellulose is extracted from wood) for fuel. Black liquor supplies pulp and paper industries with their greatest source of fuel. In 1981, black liquors supplied 38 percent of the industries' total energy needs.

The Office of Energy Resources expects the use of wood to increase. Optimistic projections predict a doubling of wood use by the turn of the millenium (Table H). Even non-forest industries have begun to turn to wood. Brunswick Naval Air Station, for example, expects to use 40,000-60,000 tons of chips a year in its boiler. Jackson Laboratories in Bar Harbor is also converting to wood chips.

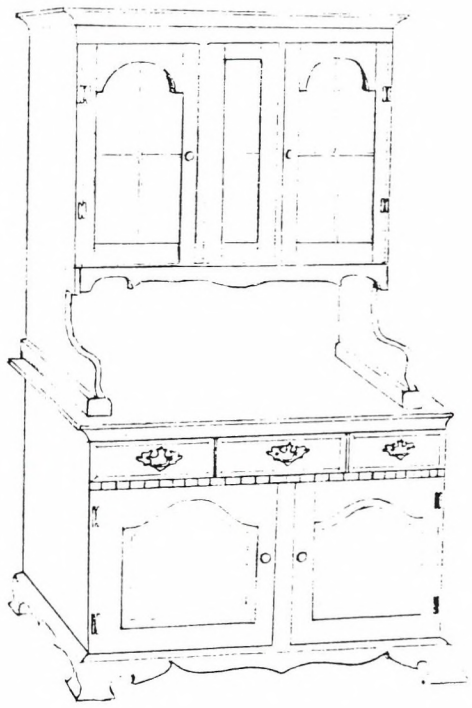
Table H

Energy Use Requirements in Maine by Fuel Type in Trillion BTU's

	1978	1985		1990		2000	
		High	*Low*	*High*	*Low*	*High*	*Low*
Gasoline	71.79	66.39	64.78	62.83	59.60	50.60	44.12
Distillate	68.65	66.16	53.91	61.35	51.11	56.38	44.69
Residual	61.77	71.90	53.80	70.78	49.64	79.99	40.23
Nuclear	57.66	57.66	57.66	57.66	57.66	57.66	57.66
Hydro	29.44	30.09	30.59	30.59	31.09	31.09	31.69
Miscellaneous Petroleum	22.04	26.54	22.90	28.66	23.34	35.52	23.93
Wood	19.25	23.70	33.50	27.10	37.70	33.50	46.80
Aviation Fuel	14.25	5.00	5.00	5.00	5.00	5.00	5.00
Imported Electricity	9.23	14.02	13.00	18.45	16.46	29.27	24.56
LPG	8.11	9.40	9.32	10.33	10.26	10.49	10.41
Kerosene	4.74	1.74	1.70	0.00	0.00	0.00	0.00
Natural Gas	2.15	4.53	2.84	7.67	3.50	13.02	5.29
Coal	0.50	1.96	1.44	4.47	2.90	14.20	11.79
TOTAL	369.58	379.09	350.44	384.89	348.26	416.52	346.17*

*Includes electrical generation losses

SOURCE: Comprehensive Energy Resources Plan, 1981.



Sketch used with permission of Moosehead Manufacturing Company.

Wood Products Markets

Harvesting trees from Maine's forests for use as diverse wood products tells only half the story. Marketing forest products brings the story to a climax — the real value of a product is determined at the marketplace.

Many firms, such as paper companies, compete in the global marketplace, others compete only locally.

Increase the Value at Home

Provide advice and assistance on utilizing and marketing the wood products of the State.

— 12 MRSA §8002

Many products which leave Maine do not benefit from the value-added concept. Value-added is "the difference between the cost of goods and services purchased by a manufacturer and the value of the products sold. It is value-added that provides the money for salaries, profits, taxes, and the like."[8] Although wood products leave Maine, value is added to these products in other states. For example, 1000 board feet of red oak cut as chair parts valued at $2,500 arrives in Massachusetts where they are assembled and finished. The value of the chairs paid by a furniture dealer can be quadruple that of the unassembled parts. Not only does this represent a loss of dollars to a potential Maine manufacturer, it also denotes a loss of tax dollars to the State.

In 1977, the U.S. Forest Service ranked states according to the volume of timber removed versus value-added to lumber and wood products. Maine ranked *thirteenth* (13th) in the amount of timber removed from the forest. But the State ranked only *twenty-fourth* (24th) in value-added to lumber and wood products. These figures contrast with such states as Indiana which ranked thirty-third (33rd) and thirteenth (13th) respectively. Even in paper and allied products, Maine ranked only *fifteenth* (15th). A more balanced forest economy is illustrated by North Carolina which ranked seventh (7th) in volume of timber removed, fifth (5th) in value-added for lumber and wood products and thirteenth (13th) in value-added for paper and allied products.

A study conducted by the Maine Development Foundation for the State Development Office, the State Planning Office, and the Maine Forest Service concluded that there is potential for growth in paper converting, printing, and wood products industries. Existing companies represent the greatest likelihood of expansion into new products.

Plans for an extended utilization and marketing program within the Maine Forest Service may encourage new or expanded wood products industries in Maine, especially those in Table I. A major thrust of the programs will be to promote value-added products.

Table I
Targetted Maine Wood Using Industries with Potential Growth

Industry	Projected Maine Potential
PAPER CONVERTING & PRINTING	
Business Forms	Medium-High
Commercial Printing, Lithographic (includes magazine printing)	Medium-High
Envelopes	Medium
Book Printing	Medium
Stationery, Tablets & Related Products	Low-Medium
Greeting Cards	Low-Medium
Pressed & Molded Pulp Goods	Low-Medium
Misc. Converted Products	Low-Medium
WOOD PRODUCTS	
Particleboard (includes waferboard	High
Pallets & Skids	Medium-High
Household Furniture	Medium
Mobile Homes; Prefabricated Wood Buildings & Components	Medium
Office Furniture	Medium
Sporting & Athletic Goods	Medium
Miscellaneous Wood Products	Medium
Millwork	Medium

SOURCE: 1980 and 1981 Industrial Outlook. U.S. Department of Commerce

An example of a new wood product from Maine is the reconstituted wood panel (See Figure 22). Composition board, made of sawdust particles; particleboard, constructed of small chips; waferboard, composed of larger wafers; and oriented strandboard, formed from narrow strips positioned lengthwise and crosswise for greater strength, all compete with plywood. These new products offer a good opportunity to use small diameter, poor quality trees all too commonly found in Maine. The sound portions of spruce budworm-killed or-damaged wood and underutilized species are potential raw materials as well.

Research into other products, especially those made from less desirable wood, is being done by the University of Maine, the U.S. Forest Service and the forest industry. Animal feed supplements, oils, pharmaceuticals, glue extenders, wood ash fertilizer and adhesives from bark are all products which have potential for using less desirable species of wood. The list needs to be expanded so that renewable raw materials substitute for costly non-renewable resources, such as petroleum and metals.

Marketing Cooperatively

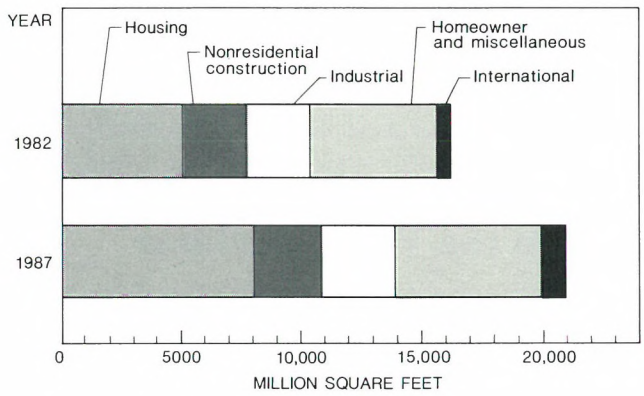
Maine citizens possess many skills in creating wood products. The Maine Forest Service, as part of its utilization and marketing program, helps artisans to make their production more efficient. Information is also given on moving products from the mill or shop to the consumer. Plans call for expanding the program to include business information, identification of new markets, matching suppliers of species of wood with those who use wood and helping producers through all phases of the marketing process.

Maine's economy, for the last 100 years, has dragged behind the nation's as a whole. Its work force typically earns 80-85 percent of the average for the rest of the U.S. "Eighty percent of Maine families...cannot afford a new home and will probably not be able to in the near future,"[9] according to the 1982 "Governor's Economic Report." Economically, in a word, Maine is poor. An aggressive, well-informed approach to production and marketing may help improve that situation.

One means of marketing round wood products is cooperatives. In a number of European countries, especially Scandinavian countries, cooperatives operate successfully. Providing services for their members, they may design forest management plans, arrange logging and timber sale agreements, and even operate wood product manufacturing facilities. In Maine, however, cooperatives have not thus far fared as well but may be slowly gaining acceptance.

The Forest Products Marketing and Management Cooperative in Dover-Foxcroft organized in 1979 to provide assistance to members in marketing of forest products.

Figure 22
Structural Panel Demand in the U.S., 1982 and 1987, as Forecast by the American Pulpwood Association



SOURCE: American Pulpwood Association

Members receive information on legislation, timber markets, and forest taxation. Approximately 200 members are currently on their roster.

The Portland Wood Fuel Cooperative also began in 1979. The organization buys seasoned firewood from suppliers for resale to members and to others, including low income families and the elderly.

Because their economic conditions tend to be worse than the State as a whole, rural areas are targeted for greater assistance in marketing their products. In the State's cooperative agreement with federal agencies on rural Maine, emphasis is upon promoting the value-added concept. The Maine Forest Service participates in the federally sponsored Resource Conservation and Development Project (RC&D). The Project's goal is to expand the economic opportunities in localities "for orderly conservation, improvement, development and wise use of the natural resources."[10] Currently four RC&D forestry projects are in place.

A report to the Downeast RC&D Council, advisors to the project, revealed that numerous opportunities exist for new and expanded wood product businesses to operate in the Downeast area (Washington and Hancock Counties). Operation of a dry kiln, white pine sawmill, wholesale lumber yard, cedar clapboard and shingle mill all represent potential successes in the area. Furthermore, local suppliers of raw wood material are presently crowded out of the marketplace by large scale outside suppliers. "Local suppliers will need to incorporate competitive business practices into their operations to gain business now lost to outsiders."[11] Correcting sporadic deliveries could be a first step toward improving the business opportunities of local wood suppliers.

Concentrating even closer on the poorest economies, the administration created a Task Force on the Economy of Washington County in 1982. Its highest recommendation was for port facilities in Eastport. Exports of wood products would easily find destinations in Europe. Closely related to this was a second recommendation for improved highway networks to facilitate exportation.

Future Demand & Supply

Wood for the World

The future is always hazy, but certain facts cannot be disputed. The world's forest reserves are dwindling as massive numbers of people, especially in the lesser developed countries, struggle for the bare essentials of life. Three-fourths of the world's people rely on wood for heating and/or cooking fuel. With the world's population expected to increase by more than fifty percent over the last quarter of this century, is it any wonder that the demand for wood and consequently its price will rise?

Already the forests of Asia, Africa, and Latin America are declining. Agriculture has spread and the need for firewood for heating and cooking has expanded — both in response to the growing numbers of people. Although its findings are the subject of recent controversy, the **Global 2000 Report** predicts that by the year 2000 "some 40 percent of the remaining forest cover in less developed countries will be gone..."[12]

"In many tropical forests, the soils, landforms, temperatures, patterns of rainfall, and distribution of nutrients are in precarious balance. When these forests are disturbed by extensive cutting, neither trees nor productive grasses will grow again."[13]

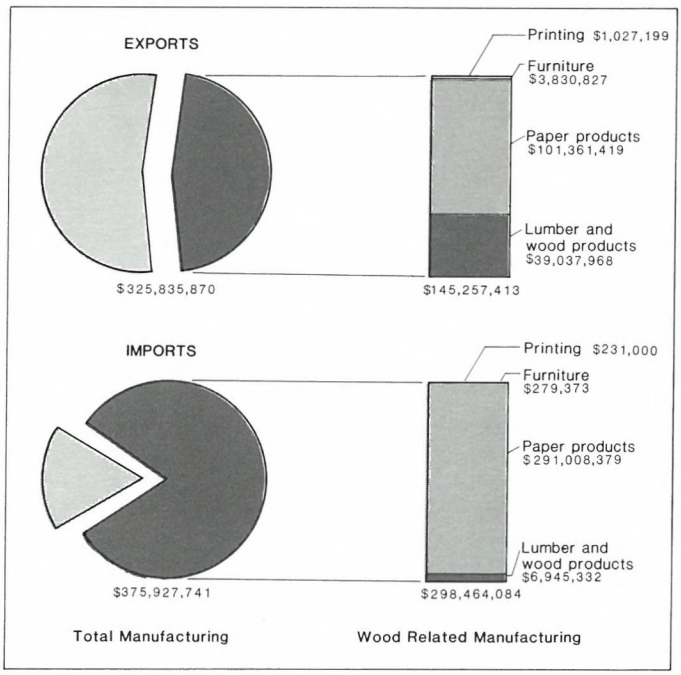
Europe, the Middle East and Japan are already looking to this country to meet their wood demand. Exportation of wood products to other countries presents a whole array of unique but fundamental problems such as import tariffs, trade restrictions, quotas, and even lumber dimension size differences. Figure 23 shows the 1982 level of foreign trade by manufacturing industries. The opportunity for considerable expansion into world markets is at its infancy in the State.

Demand in the U.S.

On the national horizon, future expectations for demand are somewhat cloudier than for world demand. In **An Analysis of the Timber Situation in the United States, 1952-2030**, the U.S. Forest Service predicts that, between 1976 and 2030, the demand for wood and paper products will double.

Between 1965-1975 the economy grew significantly. The housing industry flourished and production of Maine spruce and fir sawlogs doubled from 240 million

Figure 23
Foreign Trade by Maine Manufacturers, 1982



SOURCE: Census of Maine Manufactures, 1982

to 521 million board feet. The paper industry grew and spent millions of dollars on plant modernization.

After 1975, the economy slid downward. Oil prices soared, interest rates climbed, inflation grew steadily, and the housing industry plummeted. For at least the short term, the "forecast for the wood products industry anticipates an absence of strong demand growth."[14] Moreover, Maine must compete with the South and the Northwest.

In spite of strong Canadian competition, especially in pulp and paper, Maine may be in a favorable position. A supply of raw wood materials is available. Closer than most other states to European markets, somewhat close to mid-Atlantic and mid-western markets and certainly close to New England markets, Maine has the potential to enjoy a transportation advantage. Other factors may play to Maine's advantage as well. For some time, steel and clay products have competed with wood in construction. But both steel and clay products are costly to produce. Steel requires about three times the energy to process as wood. And plastics, which replaced paper for some products, especially packaging and disposables, are dependent on costly petroleum.

Furthermore, cutting in the Northwest on industry-owned lands has exceeded growth by 113 percent. Most of the extensive cutting has been of old-growth Douglas fir and most of the remaining forest has at least 25 years before maturity. Maine needs to more aggressively capitalize on these advantages.

The South offers heavier competition; forest industry there is expanding. Projections are for continued expansion for decades into the twenty-first century.

Demographics and Demand

The nation will continue to demand from Maine forests but the demand will change because the nation itself is changing. Maine is reflective of this trend.

Since 1947, the year of the highest birth rate, the number of babies born per thousand population has declined by one half. In 1976, the rate of population growth in Maine hit zero — 2.1 births per woman — the replacement rate.

In 1960, the average household size was 3.29 persons; twenty years later, it was 2.75, a decline of 16 percent. Today, there are many more families headed by a single parent than there were twenty years ago.

As population is changing in numbers, so is it changing in age structure. In 1960, 11.2 percent of the population wasn't old enough to attend public school (i.e. younger than age 5). Twenty years later, that percentage has shrunk to 7 percent.

The age structure of the population has shifted. In years to come, the older sector will comprise a greater proportion of the entire population than it ever has. Yet, the most notable change in demographics will occur as the largest percentage of the population moves into the middle age class. This middle-age segment traditionally has the highest incomes and demands the most goods and services. The attitudes and lifestyles of these people will significantly affect market demand, and thus the quality and quantity of products from the forest.

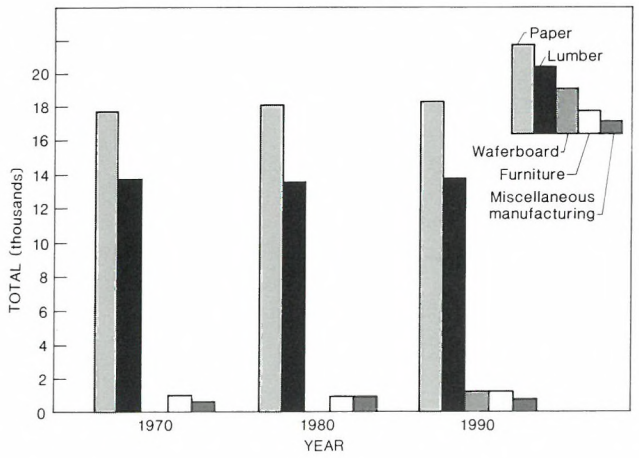
Unique more to Maine than to many other states is migration. For the first time in three decades, significantly greater numbers of people migrated into the State than migrated out. Between 1960-1970, 70,000 people left Maine. Over the next ten years, the trend reversed itself with 75,000 entering Maine. The distribution was not state-wide though; York County added 19,000 in-migrants to its population while Aroostook County lost 12,000 of its residents. Housing starts changed accordingly. In York County, new housing increased by 37 percent. The areas of permanent settlements have changed very little since a century ago Figure 5, page 17). The inflow of new residents into the State is not expected to continue and, therefore, should not be viewed as a trend upon which to make supply-demand projections.

All of this translates into changes in the types and amounts of goods and services people will be demanding. Fewer schools, smaller homes, multi-family homes, mobile homes all fit into Maine's future mold.

Examination of the mobile home industry alone reveals significant trends. Between 1960-70, 8,500 mobile homes became new residences. Over the next ten years, that figure more than doubled to 18,000. And of the years 1975-80, almost one-half of the new single family homes were represented by mobile homes.

The outlook for jobs in Maine in the forest industry is expected to remain relatively stable and perhaps grow slightly by 1990 (Figure 24). As the forest industry plans for the future, demographic changes promise changes in the work force. The percentage of the population under age 25 is decreasing. Traditionally, this age group

Figure 24
Forest Industry Employment in Maine, 1970 and 1980, with Projections to 1990



SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis and Maine State Planning Office forecasts.

has caused the most job-related problems. The future promises more skilled workers less prone to joblessness. This factor offers many opportunities for the wood products industry. As the industry relies more upon increased technology in machinery, for example, skilled operators will be even more essential.

Forest Surveys — Counting Trees

Every tree that is to be harvested at the beginning of the next century has to be growing now.

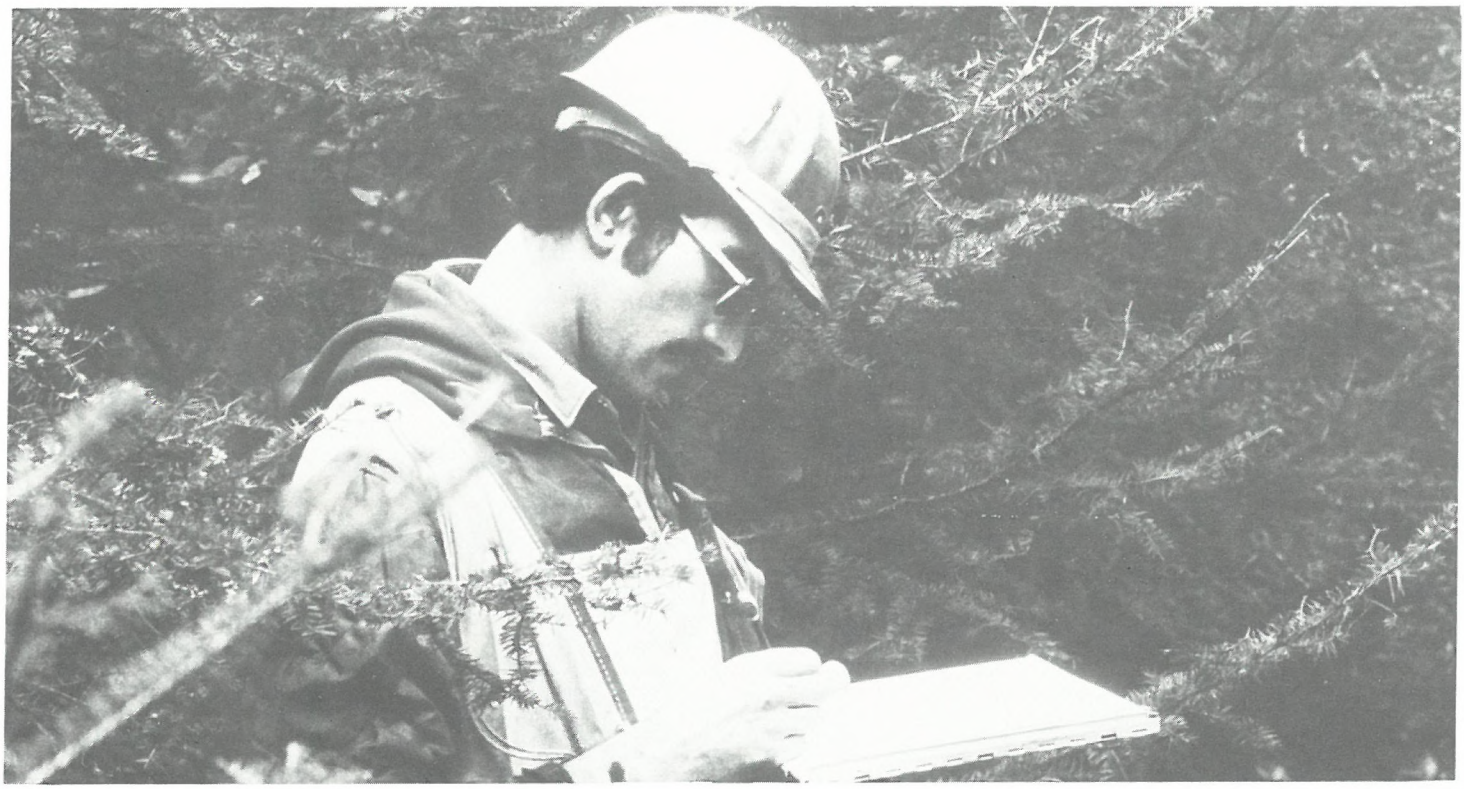
"State of the Environment"
Conservation Foundation, 1982

As efforts increase to diversify and improve Maine's marketing potential, the supply of the raw material must be carefully examined. The most valuable information on the condition of Maine's forest is found in the decennial surveys conducted by the U.S. Forest Service.

Nearly a century ago, citizens' fear of dwindling forest resources prompted the U.S. Bureau of Forestry (now the U.S. Forest Service) to survey Maine's forest. Austin Cary, the nation's first company forester, trekked throughout the State taking inventory of spruce trees suitable for sawlogs and pulpwood.

As interest in and dependence upon the forest grew, the federal government recognized the need for an overview of the timber resource. In 1928, Congress enacted the McSweeney-McNary Forest Research Act. The Act and subsequent amendments require the U.S. Forest Service to conduct a series of continuing forest surveys in all states. Together, the surveys provide up-to-date pictures of the forest resources of the nation.

Three surveys have been conducted in Maine. The first, carried out between 1954-58, concentrated on timber. Some 2,267 ground plots were established throughout the State; they were permanently located so that selected plots could be remeasured in subsequent surveys.



The second survey, conducted between 1968-70, remeasured 902 of the previously established plots and established 1,587 new plots. Again, to fulfill requirements of the McSweeney-McNary Forest Research Act, the survey was timber oriented.

Planning for the third survey revealed needs for additional information of interest to the individual states. Because trees are only one facet of an intimate ecological relationship, the 1982 resurvey, known as the Maine Forest Resources Evaluation, will examine the entire forest resource including wildlife, recreation, soils, water, and ownership patterns, as well as timber. The Federal Resources Planning Act and the Forest Management Act require this expansion in scope. Thus, for the first time, the U.S Forest Service collected significant soils information, evaluated recreation potential and watershed conditions, and measured wildlife habitat for the survey.

In planning Maine's 1982 resurvey, the Maine Forest Service requested State financial participation for a more intensive survey. The Legislature responded with sufficient funding to establish additional ground plots and increase the amount of aerial photography. Over 3,600 plots were examined — 902 had been measured in both previous surveys, 1,300 had been established and measured for the 1971 survey, and 2,400 were new. As of this writing, all measurements have been taken. When completely analyzed, the data will provide an intensive look at the present condition in Maine's forest as well as trends and changes of the past thirty years.

The resurvey information will be invaluable in promoting more comprehensive forest resource and land use planning, and in serving as a foundation for the revision of this document. The resurvey results will be readily available to other state agencies, planning agencies, municipal officials, landowners, industries, and individuals seeking forest resource information.

The discussion which follows uses 1982 preliminary resurvey data where possible.

Present and Future Forest

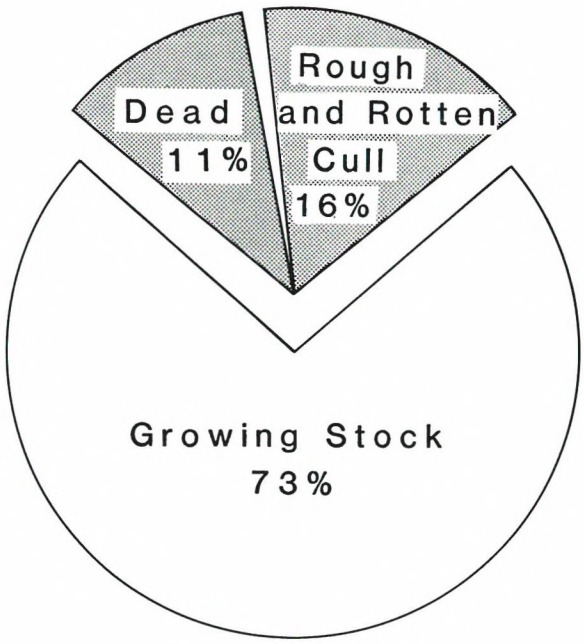
According to the 1971 survey, four of Maine's most popular and valuable species — white pine, northern white cedar, yellow birch and sugar maple — were being overcut. The 1982 resurvey shows that, statewide, these species have recovered although marginally. In some areas of the State, however, overcutting is still occurring.

Where species are being overcut, the situation can be likened to a savings account with volume being the principal and annual growth the interest. It is best to use the interest for expenses and keep the principal intact. Although occasions sometime necessitate drawing on the principal, this portion of the account should be restored as quickly as possible.

Overcutting, however, may not necessarily indicate loss of valuable wood. Maine has many trees, 94.4 billion, and, in some cases, too many trees. Almost all of Maine's forestland is densely stocked, if not overstocked. Enough trees occupy the land so that idealistically, the land could realize its full growth potential. Across the nation, the forest is averaging only about sixty percent of its potential growth. "With more intensive management, . . . timberlands can grow more than twice the volume of timber they are growing today."[15] Maine is no exception. As of 1982, Maine's forestland, on the average, was producing 28 cubic feet of timber per acre per year. Ideally, at least half of the land could produce 80 cubic feet per year.

Careful examination reveals that the forest contains many low-value trees in both quality and species. Rough (possessing severe defects due to roughness or poor form) and rotten (rotting of more than 50 percent of the merchantable portion) and dead trees make up 27 percent of the timberland (Figure 25).

Figure 25
Percent of Number of Trees on Maine's Commercial Forest Land by Tree Classes, Hardwoods and Softwoods, 1982



SOURCE: *Forest Statistics for Maine, 1971 and 1982*

Furthermore, the total volume of growing stock, that is all commercial trees 5.0 inches dbh (diameter at breast height) and larger, is composed of far more small diameter trees than large (Figure 26).

The different commercial uses of trees tell different stories also. Large diameter sawtimber is on the decline. Hardwood sawlogs of grade one (highest) quality make up only ten percent of the total sawlog volume, a reduction from 12 percent in 1971 and 17 percent in 1959.

Between 1959 and 1972, demand for quality hardwood sawlogs was high, particularly accounting for the decline.

High quality specimens of species preferred by the wood-turning industry, particularly sugar maple, yellow birch, white birch, and beech, are also dwindling. This wood must be as free as possible of knots and contain no rot. The future points to the turnery industry experiencing increased difficulty in obtaining suitable wood.

Thus, the over-all quality of the forest is poor. For pulpwood, this situation is acceptable. And, in fact, the total volume of trees which can be used for pulpwood increased since 1959 by 33 percent. The *quantity* of trees of desired species keeps pulpwood mills productive. But, for lumber and many other wood products, *quality* is required to maintain a vigorous industry.

Twelve years ago, the U.S. Forest Service, in its report on the 1971 resurvey declared that "if Maine's timber-based industries are to continue to grow at a rate comparable with recent years, these areas must be managed."[16] This statement applied to both industrial and non-industrial lands. It is expected that the U.S. Forest Service will draw the same conclusion in the 1982 resurvey.

Why Own Forestland

The total acreage of Maine forestland is generally stabilized and cannot be expected to increase significantly in the future. The only possible way to increase the wood supply, therefore, is to increase productivity of the existing forest through improved management practices.

"Report of the Joint Select Committee on Forest Resources", 1977

Regardless of sizes of parcels of land or who owns the land, treatment of the forest ranges from abuse to apathy to nurture. Some owners cut their forest indiscriminately with little consideration given to the residual stands or to the future of the stands. Often this results in "high grading", whereby the largest, most vigorous trees are cut leaving inferior forest stands for the future. Other owners leave their forest unattended, allowing poor quality trees to crowd the more valuable ones. The stands grow slowly. Still other owners have their forests cut as part of long-term management plans. Some owners cut their own forest, primarily for firewood. There are also owners who value the forest for non-economic reasons — the chance to use the forest for recreation, for wildlife habitat and/or aesthetics. And there are many other owners whose choices lie somewhere in between.

To those who practice sound forest management, the rewards can be great.

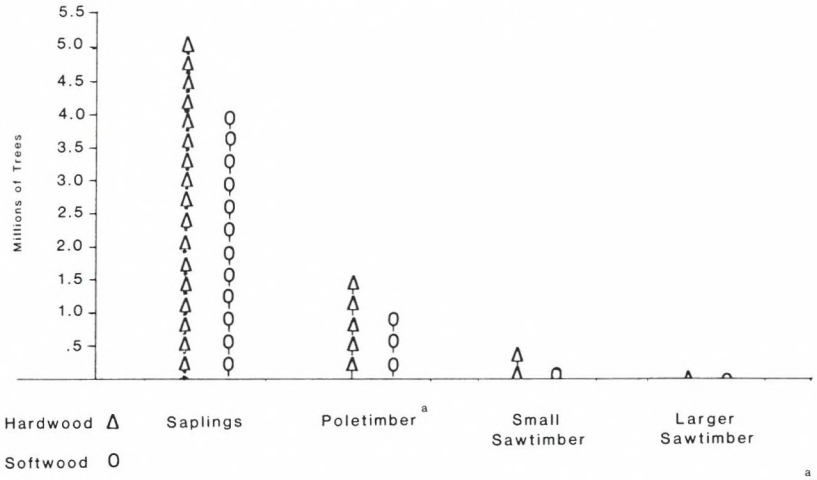
A well-managed forest can increase quality growth by up to 200 percent. Trees of poor quality are removed allowing remaining trees to grow more vigorously in size (both height and diameter) and value in a shorter period of time. The forest can be considered a crop, with the major difference between it and an agricultural crop being the length of time to grow.

A well-managed forest can provide wood for industry or firewood for winter use. If poorer quality trees are used for fuel or pulpwood, leaving the better quality trees to mature for sawlogs, then the forest can provide more dollars as well as warmth and energy. A vigorous, multi-age, multi-species forest attracts a variety of wildlife. Recreation can occur easily in a healthy forest. And a well-managed forest will provide for generations to come.

What then is meant by management of forestland? How is it achieved? And who is responsible? The following discussions explore these questions.

Figure 26

Number of Growing Stock Trees on Maine's Commercial Forest Land by Diameter Classes, Hardwoods and Softwoods, 1982



[a] Poletimber: 5.0-8.9 d.b.h. (softwood); 5.0-10.9 d.b.h. (hardwood)

SOURCE: *Forest Statistics for Maine, 1971 and 1982*

Forest Management

Old Is New

The best regulated forests...(are treated by) the German method, which embraces not only the securing of the largest immediate profit, but the replanting of the forest and the care of the young growth. This is effected in the case of a forest, whether natural or artificial, which is to be subjected to regular management, by three operations.

The first of these consists in felling about one-third of the wood, in such a way as to leave convenient space for the growth of young trees. The remaining two-thirds are relied upon to replant the vacancies, by natural sowing, which they seldom or never fail to do.

The seedlings are watched, are thinned out when too dense, the ill-formed and sickly, as well as those of inferior role and the shrubs and thorns which might otherwise choke or too closely shade them are pulled up. When they have attained sufficient strength and development of foliage to bear or to require more light and the second step is taken, by removing a suitable proportion of the old trees which had been spared at the first cutting; and when, finally they are hardened enough to bear frost and sun without other protection than that which they mutually give to each other, the remainder of the original forest is felled, and the wood now consists wholly of young and vigorous trees.

The result is obtained after about twenty years. At convenient periods afterward, the unhealthy stocks and those injured by wind or other accidents are removed and in some instances the growth of the remainder is promoted by irrigation or by fertilizing applications. When the forest is approaching to maturity, the original processes already described are repeated; and is, in different parts of an extensive forest, they would take place in different zones, it would afford indefinitely an annual crop of firewood and timber.

— George Marsh
***Man and Nature or Physical Geography as Modified by Human Action*, 1864**

Management Techniques

For the purpose of this plan, "management" includes silvicultural techniques — planting, pruning, thinning, harvesting — as well as use of prescribed burns, chemical and biological pesticides.

Planting can ensure that the right number of desired species of trees begin growth on a site, especially if genetically superior seedlings are planted after areas are heavily cut or clear cut or converted from another use. In addition, a stand may be converted from one composition to another by planting desired species.

Pruning is the removal of lower branches to specific heights from vigorously growing trees. This silvicultural technique allows growth of knot-free wood in the layers of wood added after pruning, thus increasing the quality of the stem. Pruning can also help control disease infections and spread such as for white pine blister rust cankers on branches of white pine.

Thinning and harvesting techniques have been discussed in detail beginning on page 17.

A discussion of prescribed burns can be found on page 32.

Both insecticides and herbicides are classified as pesticides. Insecticide usage has been explained on pages 39-42. Herbicides are chemical pesticides which destroy targeted groups and species of plants; their use is on the increase. Landowners, especially in the spruce-fir region, are relying on herbicides to promote softwood growth by reducing competition from less desired hardwood growth.

Because use of chemical herbicides is controversial, the Society of American Foresters issued a statement of position. "The Society of American Foresters supports the use of herbicides registered by the US-EPA in the forest environment when the chemicals are applied according to the label directions, environmentally safe, cost-effective and necessary to control unwanted vegetation."[17]

Many of the concerns on use of insecticides are also applicable to the use of herbicides (pages 39-42). Questions continue on their effects upon soil, water, wildlife and human health.

Still further controversy surrounds individual chemicals. For example, 2,4,5,-T was a widely used herbicide but during manufacture it often became contaminated with TCDD (2,3,7,8,-tetrachlorodibenzo-p-dioxin). Dioxin is one of the most toxic substances know to humankind. The herbicide is now prohibited from use.

Because of these concerns, research must continue. Meanwhile, landowners, in determining management strategies, must examine all options with both short- and long-term views.

For some landowners, such as utility and railroad companies, and the Maine Department of Transportation, whose holdings are mainly rights-of-way, the planting of desired vegetation may be more effective than using herbicides or relying on crews to cut undesired vegetation.

Forest management, then, involves many techniques. The particular practices chosen depend on many factors. Overall, the three major commercial timber types in Maine — eastern white pine, northern hardwoods and spruce-fir — illustrate the need for varying schemes of management designed to reap the desired potential of each species.

White Pine Management

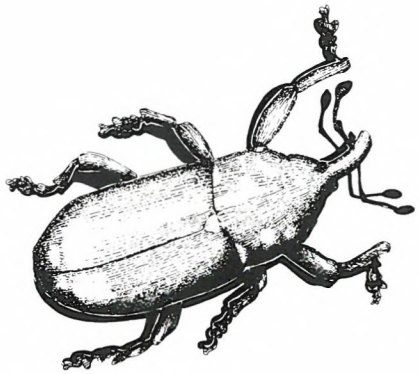
Eastern white pine has always been exceedingly valuable. Much white pine is used by the housing industry, especially for finish, exposed beams and cabinetry. Markets, therefore, fluctuate along with housing construction in response to the national economy.

White pine grows well in Maine but seldom does it attain quality without culturing. Three features of white pine growth must be considered in a management prescription: its vulnerability to both white pine weevil and white pine blister rust (discussed on page 38) and its tendency to retain dead branches.

To minimize damage by weevil, chemical sprays and/or silvicultural controls can be used. Chemicals require more precise timing of application. Silvicultural techniques must be designed to either maintain an overstory or to allow the stand to be overstocked until the trees reach a height of about twenty feet.

The only effective means of controlling blister rust is to eliminate its alternate host, *Ribes* plants, up to 900 feet from the edge of the stand.

Pruning is a management technique which increases the quality of individual trees. Landowners can thus increase the percentage of trees of select grade lumber.



White pine grows best and is thus much easier to manage in the southern portion of the State. Due to the sandy soils of that region, white pine reproduces better there than in other regions. Because of population increases and developmental pressures, however, the amount of land available for optimal white pine growth is diminishing.

The planting or regenerating of white pine on good sites should be encouraged. In fact, 17,000 acres of white pine plantations, planted since 1949, are reaching merchantability. When harvested, they could be converted to as much as 1.5 billion board feet of lumber worth up to $341 million at today's prices. While some are being intensively managed, many of these plantations are being neglected.

Intensive management is called for in both of these circumstances. Without it, the full value of the resource will not be realized.

Need for Quality Northern Hardwood

Maine's northern hardwoods are in a grim situation. They are overstocked; poor quality is commonplace. Growth is abnormally low. As much as one third are rough or rotten. Indeed for all practical purposes "...generally in Maine hardwoods are not managed."[18] The problem will become more severe as industries which rely on quality hardwoods find it increasingly difficult to locate raw material. Furthermore, if Maine is to diversify its woods products and stress more value-added products, quality raw material must be available.

In Maine, northern hardwoods can be classified broadly as old growth stands and second growth stands. The former are those which typically were part of the family farm or were heavily cut for firewood and wood products around the turn of the century. Since then most have either been neglected or highgraded ("cut the best and leave the rest"). These stands are for the most part uneven-aged, slow growing and heavily occupied with rough and rotten trees. Often they still retain signs of their use as pasture for livestock. Temporary fencing strung from tree to tree, soil compaction and tree damage resulting from the presence of livestock have contributed to the stands' poor quality.

Second growth stands are generally even-aged, having been clear cut, heavily high graded or are in stages of regeneration following forest fires. Most of these stands are overstocked and have lower than adequate growth rates.

Because "there is likely to be a continuing demand for high-quality timber regardless of species,"[19] management practices for northern hardwoods should stress quality and diversity.

Commercial thinning and salvage of poor quality trees are the most productive management techniques. "Thinning is clearly one of the most profitable ventures in which a woodland owner can engage. Thinnings that not only reduce stand density to hasten the development of crop trees but also allow the removal of low quality tops and limbs for pulpwood or commercial fuelwood are all the more profitable"[20] (Table J). Removing diseased, dying, poor vigor, multiple stem and short lived merchantable trees (such as grey birch and pin cherry), plus trees of less desirable species encourages production of large trees of the most valuable species.

Optimum nurturing of northern hardwoods requires interim harvests of low value trees approximately every ten to twenty years. Short lived trees, in particular birch and aspen, respond well to this treatment, as do shade tolerant species such as sugar maple and beech.

Ash and birch, because they require more sunlight than other species, can be treated with small clear cuts especially if an adequate seed source is available.

A key factor in optimum management of northern hardwoods is consultation with forest entomologists and/or pathologists on insects and diseases which target specific species. Among these pests are beech scale/Nectria complex, birch casebearer, gypsy moth, and forest tent caterpillar, variously discussed on pages 38 and 39.

The wood products industry can compensate for overcutting of the most valuable species, by substituting other species. For instance, red maple can substitute for sugar maple in the majority of applications where the wood is stained.

Table J.

Percentage Rates Of Value Increase For Seven Hardwood Species.[1]

Initial DBH	Sugar Maple[2]	Yellow Birch[3]	Paper Birch[4]	Northern Red Oak[5]	White Ash[6]	Red Maple[6]	Beech[7]
			SPECIES				
			RATE OF INCREASE DUE TO GROWTH ALONE				
12	—	3+	—	—	—	—	—
14	5-8	3+	5-10	19	6-8	6-10	—
16	3-8	3+	4-9	5-19	4-7	4-10	1-12
18	3-5	2.6	3-5	4-8	3-7	4-9	0-5
20	2-4	2.3	2-5	3-5	3-6	3-9	1-3
22	2-3	2.0	2-4	2-4	3-5	3-5	1-2
24	1-3	1.8	—	2-3	2-4	2-4	1
26	1	1.8	—	2	2-3	2-4	1
28	1	1.6	—	1	2	2	0-1
30	1	—	—	1	2	2	0-1
			RATE OF INCREASE DUE TO GROWTH AND INCREASE IN QUALITY				
12	28-57	—	13-30	—	—	—	—
14	11-24	—	5-26	37-40	4-23	7-18	—
16	8-18	8.8	4-15	18-35	2-53	6-15	23-34
18	7-13	8.7	4-10	13-19	3-27	5-13	9-43
20	6-12	8.5	3-8	11-14	3-21	4-12	6-13
22	5-10	8.3	3-7	9-43	3-15	4-8	4-10
24	4-8	8.1	—	9	3-13	3-6	3-8
26	4-6	—	—	8	3-12	3-5	3-8
28	—	—	—	8	—	—	3-8
30	—	—	—	7	—	—	2-7

[1] High rates of value increase in the lower initial diameter classes are due to butt log grade increases. Market prices and conversion costs are assumed to be consistent over the intervals.

[2] Mendel, Grisez, and Trimble (1973). (Pa. and W. Va. data) Vigor class II (Growth rate of 1.8 in. d.b.h. in 10 years for 12 in. tree, declining 1/10 inch for every 2 in. larger initial diameter.

[3] Leak, Filip, and Solomon (1968). (White Mt. National Forest data) Vigor class II (1.5 in. growth in 10 years) Values are for sawlog quality trees only. Veneer log tree values ranged from 1.3-2.1 for growth only, 2.1-3.7 for growth and quality increase. Merchantable height changes increased "growth only" values about 75%. Quality increase values are based on an increase in the butt-log grade of two-log, vigor III (1 in. in 10 years) tree from grade 2 to grade 1. Quality increase from grade 1 to veneer can yield much higher rates (16-18%).

[4] Mendel (1969). Vigor class II (2.2 in. growth in 10 years for a 12 in. tree, declining 1/10 inch for every 2 in. larger initial diameter.) Values are for sawlog trees only. Boltwood trees (beginning d.b.h. of 6 in.) increase at 4-5% on the basis of growth alone, up to 14% when quality increase is included.

[5] Trimble and Mendel (1969). (W. Va. data) Average of vigor classes I and III and site indices 50 and 80, except *no* value increase for SI 50 for trees 24 in. and larger.

[6] Grisez and Mendel (1972). (N.Y. and Pa. data) Vigor class II (1.9-2.0 in. growth in 10 years for red maple, 1.7 in. for white ash).

[7] Mendel and Trimble (1969). (W. Va. data) Vigor class II (1 in. in 10 years for a 12 in. tree, declining 1/10 inch for every 2 in. larger initial diameter.

SOURCE: Proceedings of the Hardwood Forest Management & Utilization Symposium, 1983.

Spruce-Fir Management

In discussing the management of the spruce-fir resource, certain differences between fir and spruce should be noted.

Fir is a prolific seeder and fir seedlings are aggressive. They establish root systems which readily penetrate duff and litter on the forest floor enabling the young seedlings to become established in great numbers.

Young fir grows rapidly in its juvenile stage; it grows best when released from shade and competition. To maintain its growth rate and prevent stagnation, early precommercial thinning (10-20 years) is required. Stagnant stands are susceptible to disease and insect attack.

Spruce is quite different. It is not as prolific a seeder. Young spruce seedlings are not as aggressive and need mineral soil to become adequately established. Spruce is much more shade tolerant and can stand suppression for many years. Spruce five feet tall and fifty years old will respond with juvenile-like growth upon release. Early release of small spruce may be important in meeting future needs.

Supply/Demand Analysis and Management

As has been described on page 15, the northern portion of the State is dominated by the spruce-fir forest. This component of the Maine forest largely supports the pulp and paper industry. Yet a substantial amount of spruce and fir has been devastated by an extended spruce budworm epidemic.

Recently in response to growing concern "about whether the State's spruce-fir inventory would be able to continue to supply wood at the harvesting levels of the 1970's,"[21] the Legislature mandated an analysis of the situation. The resulting "Spruce-Fir Wood Supply/Demand Analysis," carried out by the James W. Sewall Company for the Maine Forest Service, drew the same conclusion as the 1971 forest resurvey conducted by the U. S. Forest Service: "meeting current levels of demand in the future requires significant increases in the intensity of forest management in Maine."[22]

Whereas the resurveys give a picture of the spruce-fir forest at three points in time (1958, 1971 and 1982), the Supply/Demand Analysis represents a moving picture of trends, beginning with the 1980 spruce-fir age class distribution, (Figure 27). The Analysis is strong evidence that the spruce-fir forest is in trouble. Assuming *current* levels of harvest, management and utilization efficiency, sometime after the turn of the century the forest will not be able to meet current levels of demand (Figure 28).

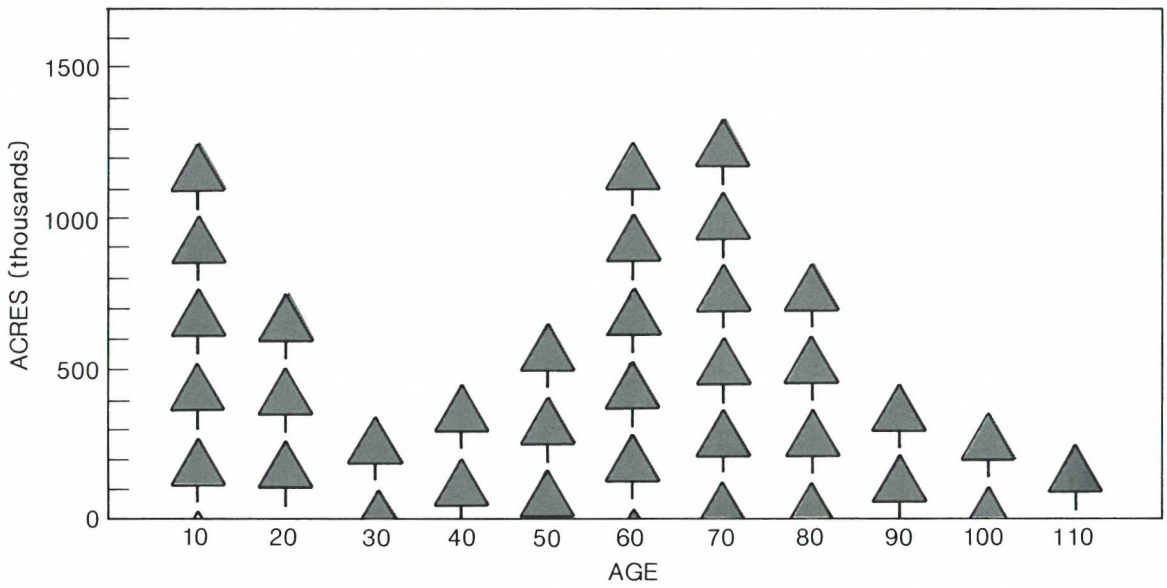
To address this problem the Analysis examined spruce-fir supply and demand from two view points. First, the biological view compared various levels of harvest and protection (spruce budworm spraying); many scenarios involving those two variables point to a shortfall of timber (Table K).

The second view assessed different management techniques for the present spruce-fir forest. Both increased alternative silvicultural management techniques and utilization of wood were examined.

More products can be obtained from the forest when trees are utilized better. The report found that by taking more of each tree (discussed on page 21) rather than leaving considerable slash in the woods, using parts of the tree previously considered wastes (see page 55), and substituting other species such as hemlock and certain hardwoods for scarcer species (refer to page 43) will help to alleviate the declining supply of spruce and fir. In pulp

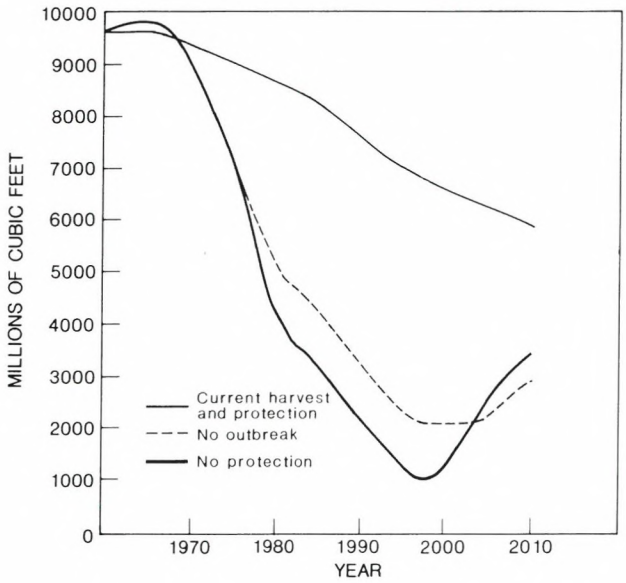
Figure 27

Estimated Maine Spruce-Fir Forest Age Class Distribution, 1980



SOURCE: Spruce-Fir Wood Supply/Demand Analysis, 1983

Figure 28
Maine's Estimated Spruce-Fir Inventory as Related to Harvest and Protection



SOURCE: Spruce-Fir Wood Supply/Demand Analysis, 1983

and paper mills, varying the cooking period in the pulp-making process and reducing the thickness of the end product (paper) may help to stretch the wood supply. Likewise, in sawmills, more efficient equipment and sawing methods can reduce wastes.

Improved utilization is just one dimension. The silvicultural techniques examined in the Supply/Demand Analysis include planting, salvage of dead and dying trees, use of chemical and biological pesticides, and thinning and control of growing stock.

The economic view looked at forest management regimes, along with their costs and yields. "With further increases in management intensity, the spruce-fir forest in Maine could produce substantially more timber."[23] However, to reach this level of production would require a significant increase in the level of investment in forest management.

According to the report, commercial thinning may offer the most promise (Table L). Moreover, protection in the form of insecticide spraying is necessary to extend the old forest so that the new forest has time to grow. But "if costs continue to increase at historical rates, protection costs will represent the single greatest expenditure on the forest."[24]

The findings and recommendations of the Supply/Demand Analysis offer alternatives to landowners to aid them in regulating the spruce-fir forest for a future forest diverse in volume and age structure. The benefits are the potential for increased growth and reduced vulnerability to damage by the spruce budworm.

Need for Analysis

Although the spruce-fir analysis has been thorough and helpful, further analysis is needed on other species in the forest — on species which can partially substitute for spruce and fir, such as hemlock, larch, and poplar; the hardwood situation, with particular emphasis on such valuable species as ash and maple; and the supply of white pine.

Intense discussions, considerations of data and probably heated debates must occur on "what should Maine's Forest be and how will we assure that vision is attained."

Table K
Spruce-Fir Wood Supply/Demand Analysis Wood Supply Simulations

SIMULATION	*INVENTORY START*	*END*	*TOTAL HARVEST ('70-'20)*	*OLD-AGE MORTALITY*	*BW MORTALITY*	*SALVAGE*	*LAST FULL HARVEST*
No Outbreak	9,358	5,866	12,289	1,727	—	—	—
No Protection	8,905	3,386	9,941	776	3,680	329	2008
Current Harvest & Protection	8,905	2,850	11,194	909	2,707	140	2014
125% Harvest	8,905	2,941	11,005	817	2,641	171	2006
90% Harvest	8,905	2,887	11,332	969	2,733	128	—
70% Harvest after 2000	8,905	3,305	11,001	936	2,707	140	—
150% Protection	8,905	2,437	12,133	1,133	1,897	126	2019
200% Protection	8,905	2,496	12,290	1,378	1,255	107	—
Improved Utilization	8,905	3,497	12,290	969	2,708	136	—
+ 10% Survival	8,948	2,620	11,895	974	2,164	140	2017
- 10% Survival	8,863	3,080	10,518	857	3,245	142	2011

SOURCE: Spruce-Fir Wood Supply/Demand Analysis, 1983

Table L

Projected Maine Spruce-Fir Timber Supply as Related to Management Practices

Price ($/cd)	Optimal Management Practices							Supply (Mcds/yr)
		Commercial Thinning	Early Stocking Control	Plantation	Commercial Thinning	Early Stocking Control	Plantation	
	None	Softwood Acres			Mixedwood Acres			
5	x							0
10	x							0
15		x						492
20		x						492
25		x	x		x			3803
30		x	x		x	x		4251
35		x	x				x	6403
40		x	x				x	6403
45		x	x				x	6403
50		x	x				x	6403
55		x	x				x	6403
60		x		x			x	7642
65		x		x			x	7642
70				x			x	7910

SOURCE: Spruce-Fir Wood Supply/Demand Analysis, 1983

Given the management problems identified, State government, private landowners, and industry must work together. Whether by incentives, regulations, more education, or a combination, sound State policy must guide Maine's old forest from a poor quality, overstocked, insect-infested, haphazardly managed forest to a New Forest of unparalled quality and vigor. Policies must be established on many issues, including:

- What must be done
- When will actions be taken
- What will be the cost
- Who is responsible

In a critique of the Supply/Demand Analysis, Dr. Gordon Baskerville of the University of New Brunswick noted that "the problem faced in the spruce-fir forest of Maine is a transitional one and needs State policies, owner management strategies, utilization practices and silvicultural tactics specifically designed to the transition (between the old spruce-fir forest and the New Forest)."[25]

Therefore, achieving the New Forest requires the commitment of those who own, those who use, and those who protect the Forest.

Small Woodlot Management

The Nation is looking more and more to the private, non-industrial landowner to meet the demand for abundant and diversified products. Without question, sound forest management is no less important on small parcels of land than on large.

Whatever may be the motives, problems, techniques in management of the forest on the industrial scale, those same issues, and perhaps additional ones, are involved in the management of the non-industrial, small (less than 5000 acres) woodland ownerships. This focuses attention on a unique situation: characteristics of private non-industrial landowners fit into no single category. Their reasons for owning land are varied. Generally speaking, people look to the forest for present benefit or future investment; for monetary gain or personal pride, for recreational use or to keep the family warm; to encourage wildlife or for a host of other reasons. Usually no one reason for owning forest land precludes another reason or a multitude of reasons.

In Maine, small woodlot owners represent every profession and background. They own 49 percent of the timberland in the State; their numbers are in excess of 100,000. Some have had their land bequeathed to them; others have searched diligently for just the right piece of property. Many consider timberland to be a good investment because:

- the inventory continues to grow
- as the inventory grows, it appreciates in value
- the inventory is renewable
- some of the inventory may always be available for sale (harvesting)
- in poor economic times, the inventory can be left to grow

Some landowners have knowledge of the principles of sound forest management; many others do not. For

many landowners, the only real attention that is paid to their land is at time of cutting. According to findings from the 1982 forest survey, 48 percent of the net annual growth of Maine's forest was on private non-industrial land, yet these same lands accounted for 45 percent of the total timber removed from Maine's forest.

Why then do landowners not maximize their land's potential? Why for example of approximately 135,000 acres of private, non-industrial forest harvested in 1983 did professional foresters assist on only 17.6 percent?

There are no definite answers to these questions. In some cases, landowners simply do not recognize their land's possible high value. Some landowners feel their acreage is too small to manage as a viable economic unit; other landowners do not have the capital to invest in forestry consultation; still others find the traditionally low stumpage (trees on the stump) prices to be financially unattractive.

For the non-economic amenities the forest offers — wildlife habitat, recreation, watershed, aesthetics — many landowners are not aware of techniques which they could employ to enhance each of these amenities.

Thus when a professional forester's advice is sought, the landowner may gain far more than just advice on how to cut his/her trees. When working with a landowner the forester ascertains the goals of the landowner — reasons for owning and interest in benefitting from the land. The forester walking with a landowner upon his/her forested land assesses the land's potentials and liabilities. Species, size and quality of trees, soil characteristics, insect and disease damage, proximity to water bodies, topography of the land are all considered. The forester points out which trees have little, if any, value, which are weak or diseased, which are valuable only as fuelwood, which have immediate market value, and which are the outstanding trees in the woodlot.

In a survey funded by the U.S. Forest Service on "Attitudes, Preferences and Opinions of the Owners of Forestland in the Saco River Basin, Maine and New Hampshire," landowners ranked aesthetic enjoyment and timber sales as the most important benefits they derived from owning forestland. They consulted foresters much more often if timber were cut to be sold to industry than if it were cut for personal use.

If the interest of the landowner centers on aesthetics or future production, the forester can recommend timber stand improvement (TSI) and/or planting practices. Timber stand improvement techniques stimulate growth of the residual stand. With old, weakened, diseased, or poorly formed trees removed, the more valuable trees are free to grow. They take advantage of increased sunlight and space to absorb nutrients. The total yield of the stand increases. The time to attain harvestable dimensions shortens. For future timber sales and production, the forester gives advice on costs of labor, taxation, markets, stumpage prices, and distances from roads, information on the individual landowner's property and the cost of holding onto the growing stands. Advice is also provided on road layout, construction and maintenance (refer to page 21). The forester may provide supervision on all aspects of woodlot management including harvesting. If the landowner is primarily or secondarily interested in improving wildlife habitat or recreation areas, the forester can recommend measures for each (see pages 74-75).

The Logger — A Key In Forest Management

One of the key decisions in creating a forest management plan is to envision the composition and appearnce of the stand after cutting. Therefore, the utmost attention must be given to who will do the actual cutting and how it will be done. The pride of and financial return to the owner can either be heightened or diminished by the quality of the logger's labor.

Over 1,800 loggers and logging contractors cut wood in Maine. Some factors regarding logging responsibilities have been discussed in **Chapter Two, Section A.** The condition of the stand *after* cutting is determined by the logger's knowledge of good harvesting practices and, more importantly, his/her regard for the stand *during* cutting. The quality of and pride in the logger's work is reflected in whether or not there is presence of damaged residual trees and roots or usable wood left on the

ground; rutted, eroded and/or compacted soil; slash left in streams; and high stumps.

The manner in which trees are cut into products also reflects the ability, concern and profits of the logger. Measurement of log lengths can be done hurriedly and inaccuracies can occur, resulting in avoidable waste and profit loss to landowners, loggers and sawmill operators. For example, an original straight seventeen-foot length of oak may be further cut so short that a good sixteen-foot sawlog or two eight-foot sawlogs are unobtainable; with poor cutting, maximum dollars are not generated.

The Maine Forest Service's Harvesting Improvement Program offers assistance to loggers. The program stresses proper log bucking (cutting logs into specific lengths), better use of equipment, safety and proper road construction. More information needs to be provided loggers on business management so that their operations can become more efficient.

Two significant issues surround woods labor. Both involve the Maine Forest Service in a circuitous manner. One — the presence of non-immigrant Canadian workers in the woods — began decades ago. Controversy centers on whether the industry's use of foreign workers results in displacement of Maine workers and results in lower wages. Immigration laws now allow non-immigrant Canadian workers to work in Maine only if they are bonded. That is, they may work in the U.S. provided "no domestic labor is available to perform the type of work for which they are being sought."[26] Maine is looking to the U.S. Immigration Service to continue to examine the issue.

The second issue centers on work injuries. The wood products industry "has the highest incidence of work injuries of any industry in the nation."[27] Currently, an employer pays $32.28 on every $100 his/her employee earns. This situation has led to ambiguity in determining which workers must receive worker's compensation insurance coverage. Independent contractors working alone do not, whereas workers classified as employees do. But definitions of the two are unclear. The Maine Forest Service will be following legislation in hopes that the dilemma will be solved.

Although the Maine Forest Service can take no direct action in these issues, it should be cognizant of present situations. Resolution of both issues would improve the work environment of the wood products industry.

A suggestion, supported by the Maine Forest Service, is for loggers to form an association to promote sound logging practices in general, outstanding loggers, and the place of loggers in forest management.

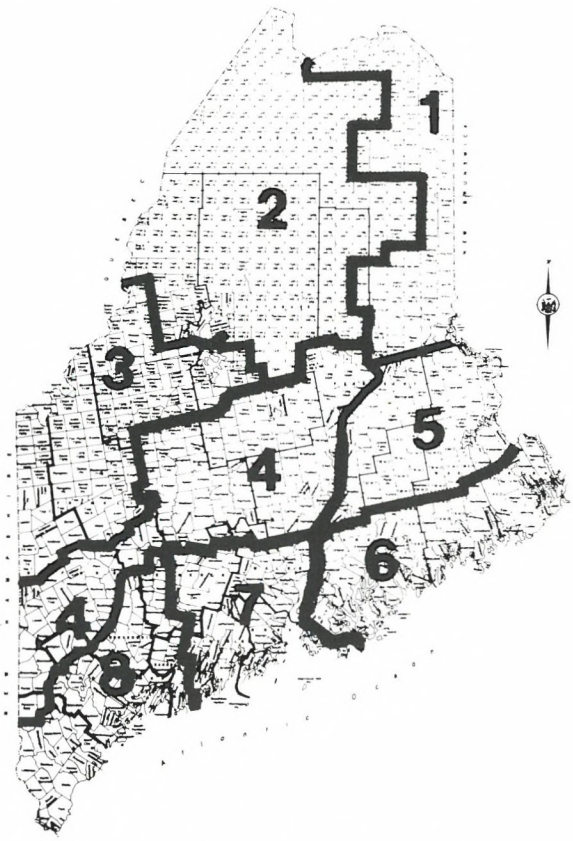
Other Uses of The Forest

Residents of the Forest

As plans for the forest are formulated, factors in addition to timber value must be considered. Forested land is shelter for wildlife therein. "Changes in the amount and type of forestland due to fire, clearing of forestland for other uses, abandonment of agricultural land, timber harvesting and the defoliation of forests by insects... have had and will continue to have a dramatic impact on the amount and type of wildlife habitat."[28] Roads, housing, dams and general development may permanently destroy habitat. In previous sections, there has already been discussion of the effects upon wildlife timber harvesting (pages 19 and 22), fire (pages 28 and 32) and defoliation due to insects (page 73).

The various species of wildlife found in Maine require different types of habitat. Generally speaking, a diversity of vegetation "varying from brush and seedlings to mature trees, from northern hardwoods to spruce and fir, from young thrifty stands to those which contain dead and dying trees"[29] supports the greatest diversity of wildlife. This habitat also includes wetlands and surface water. The Department of Inland Fisheries and Wildlife (IF&W) is responsible for managing and protecting the fish and wildlife species of the State, according to the characteristics of each wildlife management unit. Figure 29 delineates Inland Fisheries and Wildlife's management units. In addition, the Department manages wildlife refuges and 17,000 acres of waterfowl

Figure 29
Wildlife Management Units of the Maine Department of Inland Fisheries and Wildlife



SOURCE: Department of Inland Fisheries and Wildlife

habitat including 25 nesting islands. Altogether, the Department is directly responsible for almost 30,000 acres of refuge.

It is especially important to assure that the habitats of species considered rare in Maine are identified and left undisturbed. Peregrine falcon, Cooper's hawk, bald eagle, northern bog lemming, yellow-nosed vole, long-tailed shrew, and Canada lynx are among the species which deserve special attention. Although the Department of Inland Fisheries and Wildlife has concentrated most of its efforts on game species (Table M), one of its goals is to focus more heavily upon non-game species as well.

Some wildlife species represent economic contributions to the State. The sale of hunting and fishing licenses alone supports numerous programs within the Department of Inland Fisheries and Wildlife; in 1983, these sales collected over $6 million.

Conflicts with Wildlife

Harmony does not always exist between timber harvesting and the maintenance of wildlife habitat. Regulations such as the Mandatory Shoreland Zoning law (12 MRSA §4811) have been enacted to protect land and water wildlife habitat.

Competing pressures are occurring in the southern portion of the State. The area is one of the most popular for hunting and trapping; it is also the most rapidly growing in population and development. Problems will arise if wildlife habitat continues to decrease.

Deeryards have been the focus of land conflicts. Areas have been identified by Inland Fisheries and Wildlife in which deer tend to congregate to survive harsh winter conditions. Within the Unorganized Territory, timber cutting is limited by the Land Use Regulation Commission in these designated areas. Landowners have questioned if this action constitutes a taking of property

Table M
Wildlife and Inland Fish Species Managed by Maine Department of Inland Fisheries and Wildlife

Inland Fish Species
- Brook trout
- Lake trout
- Brown trout
- Landlocked salmon
- Landlocked arctic charr
- Smelt
- Lake whitefish
- Burbot
- Black bass
- Pickerel
- White perch
- Minor sportfish:
  - —yellow perch
  - —brown bullhead
  - —Pumpkinseed sunfish
  - —Redbreast sunfish
  - —Black crappie
  - —Rainbow trout

Big Game Species
- White-tailed deer
- Moose
- Black bear

Non-Native Game Species
- Ring-necked pheasant
- Wild Turkey

Migratory Game Species
- Anatidae—water fowl (includes brant, wild ducks*, geese, swans)
- Guidae—cranes (includes little brown, sandhill and whooping cranes)
- Rallidae—rails (includes coots, gallinules, sora rails)
- Limicolae—shorebirds (includes avocets, curlew, dowitchers, godwits, knots, oyster catchers, phalaropes, plover, sandpipers, snipe, stilts, surf birds, turnstones, willet, woodcock, and yellowlegs)
- Columbidae—pigeons (includes doves and wild pigeons)

***Wild Ducks**

Breeding Ducks:		Migratory Ducks:
—black duck	—common goldeneye	—scoters
—wood duck	—hooded merganser	—bufflehead
—ring-necked duck	—blue-winged teal	—scaups
—eider	—green-winged teal	—old squaw

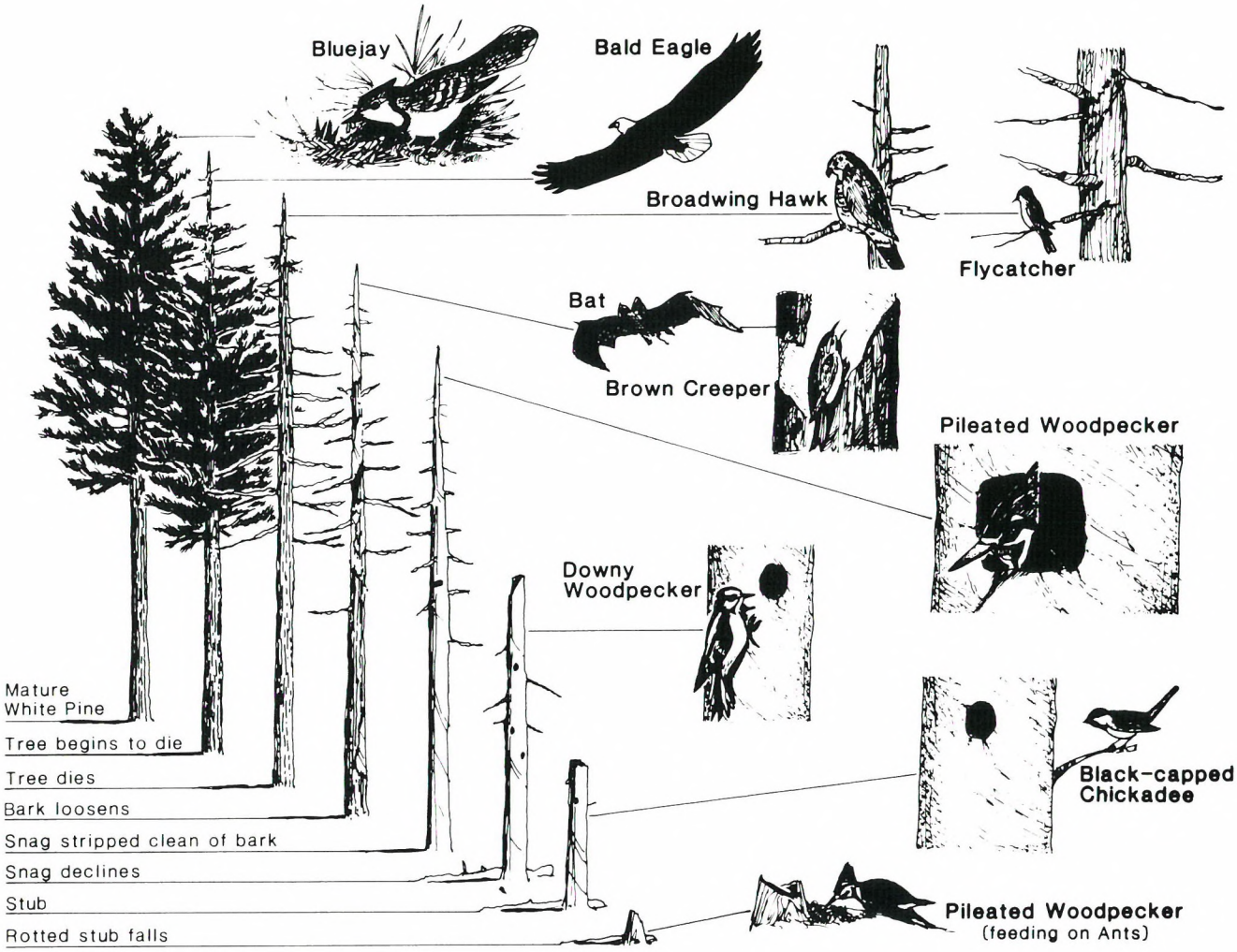
Non-Game Species
- Bald eagle

Upland Game Species
- Ruffed grouse
- Woodchuck
- Gray squirrel
- Red squirrel
- Snowshoe hare
- Cottontail rabbit

Aquatic Furbearer Species
- Beaver
- Mink
- Muskrat
- Otter

Upland Furbearer Species
- Bobcat
- Canada Lynx
- Coyote
- Fisher
- Fox
- Marten
- Oppossum
- Raccoon
- Skunk
- Weasel

SOURCE: Department of Inland Fisheries and Wildlife



without compensation. In 1982, the Maine Judicial Court ruled that the Land Use Regulation Commission's actions do not render the land entirely valueless and therefore, the contention is not valid. Further, many deeryards have been severely defoliated by spruce budworm. Their value as shelter has diminished. Some landowners want to salvage the dead or dying trees. The matter of cutting in budworm-damaged deeryards has not yet been completely settled.

Still another element of the deeryard conflict involves the spruce budworm spray project. Issues of which insecticides, if any, (chemical or biological) should be used and who should pay for spray treatment remain unresolved.

Management for Wildlife

While to some forest landowners, wildlife habitat represents a secondary concern with timber production being the primary, other landowners consider management for wildlife their most important objective. These landowners can look to foresters and wildlife biologists for assistance in wildlife habitat management. The composition of trees in a forest can be altered to attract particular wildlife species. Often management favoring one species attracts others as well. The characteristics of ruffed grouse habitat, for example, may also lure deer, bear, rabbits and squirrels.

Leaving some slash can yield just the right shelter for small mammals such as rabbits, and for ruffed grouse. Preserving a few trees which have cavities in them, although probably not valuable for timber, can assure a home for squirrels, owls, woodpeckers and wood ducks. If cavity trees are alive, they may produce mast (nuts and acorns), fruit or other food.

Dead trees, known as snags, are considered unmerchantable and are often removed from the forest for safety reasons and to make room for more productive trees. But when a few are left in the forest, they provide nesting, feeding and/or perching sites for squirrels, raccoons, mice and birds.

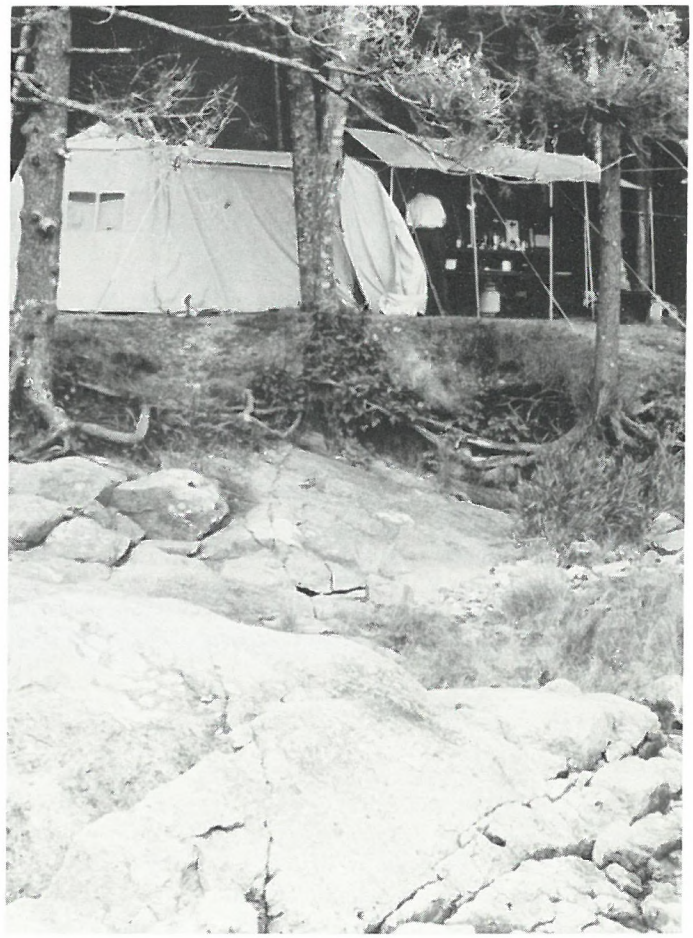
Some trees yield mast or fruit attracting a variety of birds and mammals. Apple trees are especially appealing to songbirds, white-tailed deer, black bear, and small mammals such as raccoons, foxes and squirrels.

Streams, pools and bogs offer a haven for aquatic furbearers and waterfowl. Animals are able to feed, bathe and reproduce in these areas.

By consulting more with wildlife biologists and having additional training in wildlife habitat, foresters can be even more aware of enhancing wildlife habitat as they mark trees for cutting.

Critical Areas

In examining options, landowners also need to pay particular attention to unique circumstances. Certain areas within Maine have been identified as having State significance to be preserved for posterity. Exceptional plant or animal habitat, areas of unusual geographical or historical interest and outstanding scenic areas have been included in Maine's Critical Areas Program (15 MRSA §3311). Seventy percent of the areas are privately owned; public or non-profit ownerships represent the remaining 30 percent.



Fun and Relaxation

Forest land managers must explore other non-timber issues beyond wildlife considerations in their management plans. The fact that more people than ever are attracted to the forest for personal enjoyment forces managers to prepare and plan for recreational use of the forest.

On every vehicle registered in the State, the license plate reads "Vacationland". The forest is a prominent attraction for year-round pleasures of both residents and tourists alike.

In the winter, the forest beckons cross-country (nordic) skiers, downhill (alpine) skiers, snowshoers, snowmobilers and ice fishermen.

Winter snows melt, giving way to fast-moving streams and rivers. Kayakers, canoeists, and rafters are lured to New England's finest whitewater rivers, including some of the most intense and difficult whitewater in the East. Spring fishing brings many anglers to the out-of-doors.

As spring unfolds into summer, warm sunny days entice picnickers, hikers, horseback riders, and campers to the forest, lush with green foliage. Lakes, ponds, and rivers bring boaters, swimmers and fishermen.

As the forest's leaves begin to display a myriad of brilliant fall colors, visitors arrive to gaze in wonder. Fall is also the time when most hunting activity occurs.

Most of these recreational activities are not intensive. They do not require major expenditures in facilities and upkeep, nor do they generally cause undue environmental damage. For the most part, they can co-exist with other uses of the forest.

Many landowners see their land primarily as a source of enjoyment. A forester can help a landowner to create a setting whereby trails or bodies of water or other natural features are focal points.

Forestry and Tourism

Recreational opportunities provide enjoyment while at the same time often contributing to the economy of the State. Tourism and recreation is Maine's second largest industry. This industry bolsters the economy by direct tourist expenditures and by stimulating demand for services such as entertainment and lodging (Table N). In 1983, tourist expenditures amounted to approximately $650 million according to the State Planning Office.

Table N
Tourist Expenditures in Maine, by Category

Accommodations	Hotels, Motels and Tourist Centers
	Rooming and Boarding Houses
	Camps and Trailer Parks
	Organization Hotels and Lodging Houses
	Friends and Relatives
Food & Beverages	Eating and Drinking Places
	Food Stores
	Liquor Stores
Transportation	Gasoline Service Stations
	Local Buses and Taxis
	Tolls
	Automobile Rental and Leasing
	Automobile Parking Fees
	Air Transportation
	Ferry Services
Entertainment	Movie and Theatre Admissions
	Hunting/Fishing Licenses
	Miscellaneous Amusement and Recreation Services
Miscellaneous	Miscellaneous Retail Stores
	Apparel and Accessory Stores
	Personal Services
	Miscellaneous Repair and Business Services
	Telephone Communications

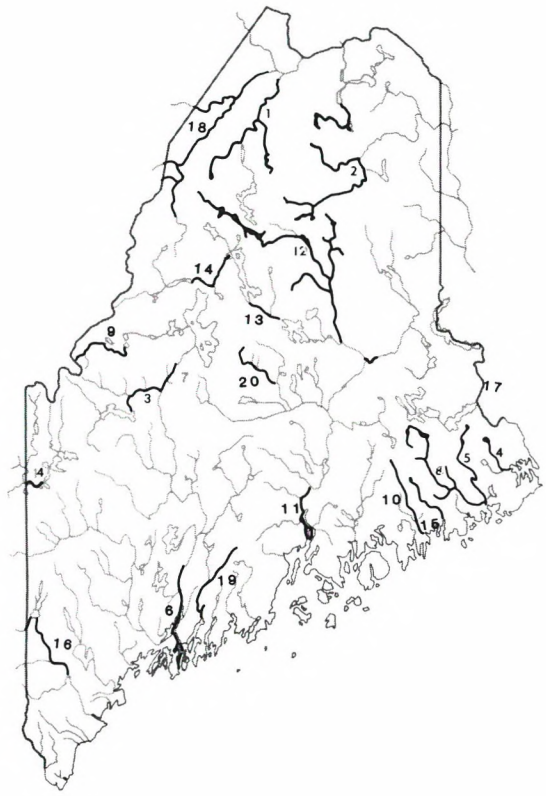
SOURCE: State Planning Office

Currently, in State government, tourism is being emphasized as a priority. A study entitled "Theming of Maine Tourism Regions", prepared in 1981 for the State Development Office, recommended that year-round recreation regions of the State be strongly promoted. The forest figures prominently in attracting tourists from outside and within the State alike.

Conflicts with Recreation

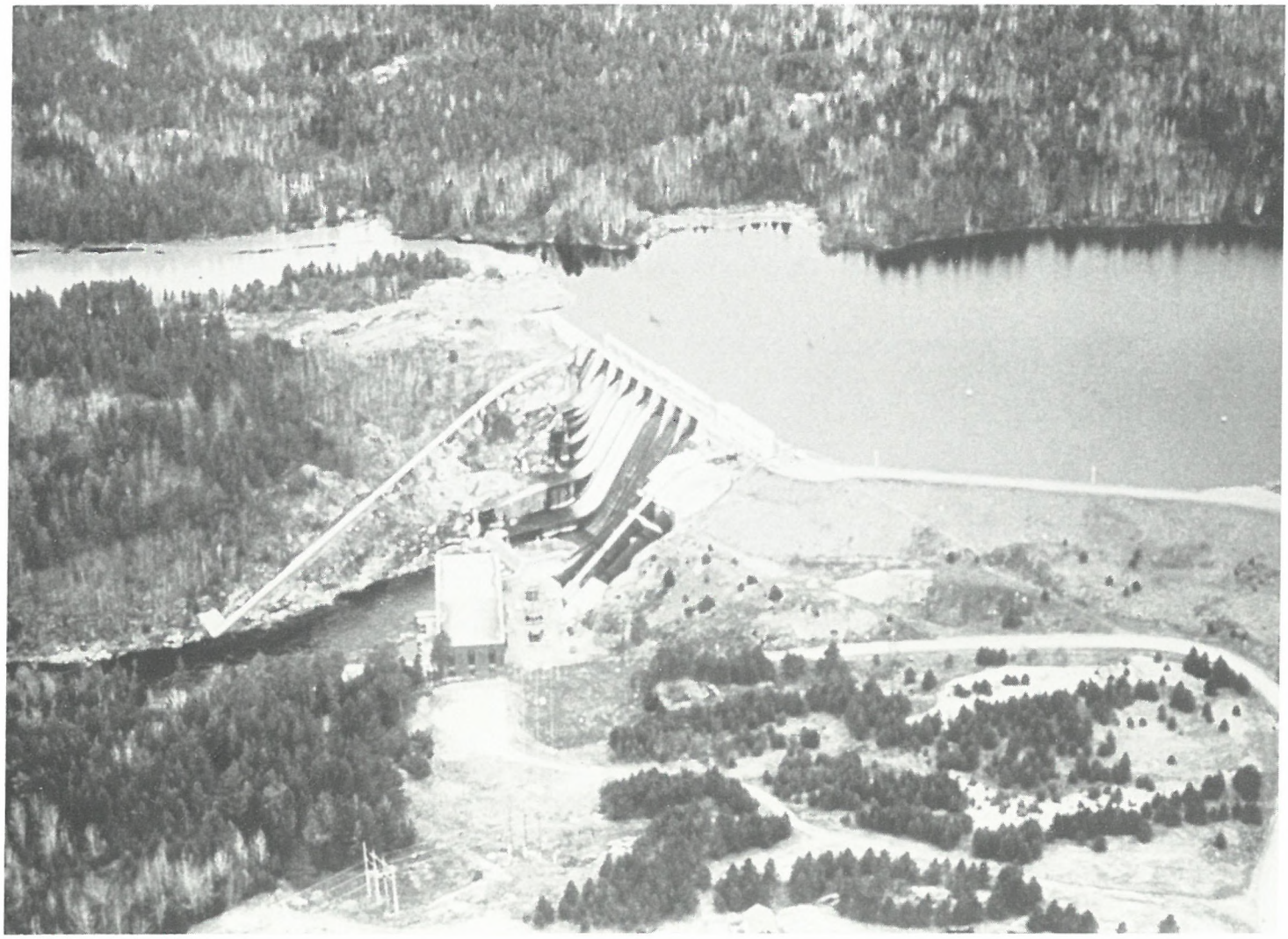
As with the use of the forest for wildlife habitat, other conflicting uses of resources can arise. In 1982, eighteen river stretches (Figure 30) which have unique recreational or natural values were declared worthy of special protection by the 111th Legislature. The policy accompanying the declaration states that "no new dams shall be constructed on these stretches, and that additional

Figure 30
Maine Rivers Meriting Special Protection



Stretches of:
1. Allagash River
2. Aroostook River
3. Dead River
4. Dennys River
5. East Machias River
6. Kennebec River, Lower
7. Kennebec River, Upper
8. Machias River
9. Moose River
10. Narraguagus River
11. Penobscot River, Main Stem
12. Penobscot River, East Branch
13. Penobscot River, Lower West Branch
14. Penobscot River, Upper West Branch
15. Pleasant River
16. Saco River
17. St. Croix River
18. St. John River
19. Sheepscot River
20. West Branch Pleasant River

SOURCE: State Planning Office



development or redevelopment of dams existing on these stretches...shall be designed and executed in a manner that either enhances the significant resource values of these river stretches; or does not diminish them." The declaration was in response to rekindled interest in energy from water.

Many dams which were originally built to provide electricity for homes and industries are still in existence today. Eighty-five are currently functional; some others are in need of refurbishing.

The Maine Forest Service needs to be alert to new hydropower proposals, offering information, especially when forested land may be flooded or road construction would be mandatory.

Conflicts have also occurred as recreational opportunities have conjunctively benefitted from logging road construction. Twenty years ago, much of the Unorganized Territory was virtually inaccessible by automobile. Today, there are more than 2,000 miles of permanently maintained roads and thousands more miles of temporary unmaintained roads which allow extensive access to Maine's forest lands.

Maine citizens have often considered the vast private forestland to be "public lands" and have used it accordingly. But public use of private land must also be accompanied by public responsibility.

As road construction creeps further into the remoteness of the "wildlands", as the Unorganized Territory is often termed, the sanctity of the wilderness character becomes threatened. The fragility of those areas which are not readily accessible to human activity is not known. Within the wildlands are 300 "remote ponds" identified by the Department of Inland Fisheries and Wildlife and so zoned by the Land Use Regulation Commission; such ponds have no camps or roads within one half mile. Need exists for evaluative research into the sensitivity of these areas to road expansion and visitor use.

Forestry Programs

For Owners and Managers

It is the intent of forest owners not to destroy the productiveness of forest lands, but to manage them that the annual growth will give continuous return.

Professor F. L. Harvey
"Preservation of Our Forests", 1891

Idealistically, then, the forest could be managed for both sawlogs and pulpwood while conserving recreation and wildlife values. High value trees would be cut as sawlogs, poor quality trees chipped as pulpwood or used for firewood and the residue burned as fuel. "Utilization yards which facilitate the separation of high valued logs from low quality material"[30] would be of immense value in achieving optimal management of the forest. And the other amenities the forest offers can be integral constituents of management plans. As Table O illustrates, various uses of the forest can be compatible.

As landowners assess their own objectives and their land's potentials, they have refined information available to them. Maps and aerial photographs can help assess potential productivity of lands and determine which species are best adapted to individual sites. Soil information, coupled with information on drainage, geology and road building can help determine best uses of sites. The potential of a site may be considerably different than what is growing now or what the landowner would like to be growing.

Computer models have been constructed which can be used to aid decision-making. The Greenwoods Model, developed at the University of Maine, for example, enables landowners to project the development of their forests under various scenarios of harvesting and protection of forestland. By applying their own specific information, landowners can use the model or one of similar design to aid them in choosing management schemes best suited to their individual lands.

Table O
Degree of Compatability Among Various Forest Uses

Primary Use	Maintain Attractive	Provide Recreation	Wilderness	Wildlife	Natural Watershed	General Conservation	Wood Production and Harvest
Maintain attractive environment	xxxxxxxxxx	Moderately compatible; may limit intensity of use	Net inimical to wilderness but does not insure	Compatible to most wildlife, less so to a few	Fully compatible	Fully compatible	Limited compatibility often affects amount of harvest
Provide recreation opportunity	Moderately compatible unless use intensity excessive	xxxxxxxxxx	Incompatible; would destroy wilderness character	Incompatible for some kinds; others can tolerate	Moderately compatible; depends on intensity of recreation use	Moderately compatible; incompatible if use too heavy	Limited compatibility depends on harvest timing & intensity; roads provide access
Wilderness	Fully compatible	Completely incompatible, can't tolerate heavy use	xxxxxxxxxx	Highly compatible to some wildlife, less so to others	Fully compatible	Fully compatible	Complete incompatibility precludes all harvesting
Wildlife	Generally compatible	Limited compatibility; use intensity must be limited	Mostly compatible though some wildlife requires vegetative manipulation	xxxxxxxxxx	Generally fully compatible	Generally fully compatible	Generally limits volume or conditions of harvest
Natural Watershed	Fully compatible	Moderate compatibility; may require limitation on intensity	Not inimical to wilderness but does not insure	Generally compatible	xxxxxxxxxx	Fully compatible	Moderate compatibility restricts harvest methods but does not prevent timber harvests
General conservation	Fully compatible	Moderately compatible; if use not excessive	Not inimical to wilderness but does not insure	Generally compatible	Fully compatible	xxxxxxxxxx	Compatible but requires modifications in methods of timber harvest
Wood production & harvest	Compatible if harvest methods strictly controlled	Moderately compatible	Completely incompatible; would destroy wilderness	Compatible if harvest methods fully controlled	Compatible if harvest methods fully controlled	Compatible if harvest methods fully controlled	xxxxxxxxxx

SOURCE: Marion Clawson, Forest Policy for the Future, 1974, p. 115.

Maine Forest Service Roles

...the State assert its role as trustees for future generations by encouraging forest management practices that ensure sustained yield of merchantable wood from trees grown to optimum size, quality and value.

Report of the Joint Select Committee on Forest Resources — 1977

The Maine Forest Service is committed to assuring vitality of all forest lands in the State and consequently is seeking to implement recommendations of the Joint Select Committee on Forest Resources and assist all landowners with problems and decisions involving forest management. The goal is to "promote and initiate those management practices which will insure a vigorous and productive forest while maintaining the integrity of the environment and enhancing the economy of the State."

To achieve this goal, two major directions are essential: protection and assistance in management of the forest resource. Protection against wildfire and insect and disease damage have been discussed in Chapter Two, Sections B and C. This portion of Section D addresses the Maine Forest Service role in forest resource management and utilization.

Forest Resource Management and Utilization — An Evolving Program

Conduct a program of service..forestry in order to provide advice and assistance on forest management to small woodland owners.

12 MRSA §8002

In 1948, the U.S. Forest Service, responding to a nationwide concern regarding overcutting during World War II and subsequent European reconstruction, created a farm forestry program. Two "farm foresters" were assigned to Maine. They provided technical assistance in proper harvesting methods to the farmers who owned much of the non-industrial private forestland. Selection harvest, whereby an adequate continuous supply of the forest resource is maintained, was the method particularly stressed. In addition, farm foresters assisted farmers with tree planting.

In 1949, the state legislature recognized the value of the effort, established the Forest Management Division within the existing Maine Forest Service, and added additional personnel.

During the 1950's, many trees were planted as part of the Soil Bank program (page 7). The Management Division expanded to include a program in utilization and marketing.

By this time, the Maine Forest Service had developed a corps of professional foresters uniquely qualified to work with forest landowners, loggers, the University, and other state and federal agencies.

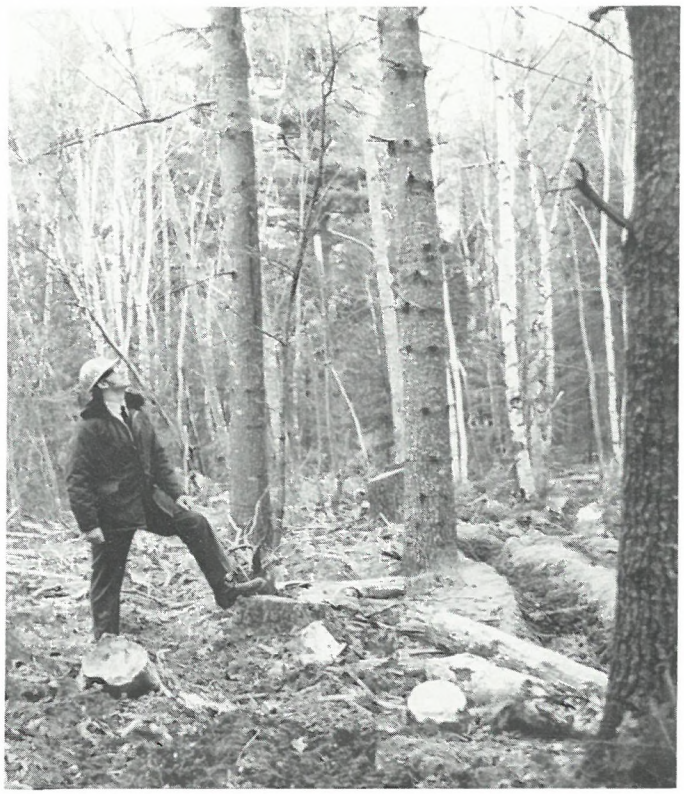
As public environmental awareness increased during the 1960's and concerns over clean water, clear air and conditions of the forest were expressed, the role of the State's foresters expanded. The education role became much more important. Foresters lectured, conducted workshops, seminars and instructural courses, designed exhibits and displays, wrote newspaper columns, and gave radio shows. They worked together with other agencies such as Resource Conservation and Development Districts, Department of Environmental Protection, Land Use Regulation Commission, regional planning commissions and forest industries.

As responsibilities increased, the Division began to concentrate on pre-commercial technical assistance rather than actual harvest cutting. The latter responsibilities became those of private consulting foresters.

During this time also, the State Forest Nursery expanded and an active tree improvement program was underway.

In 1981, however, budget cuts reduced the Forest Management and Utilization Division program by about one-third. This forced a detailed examination of the role of the Division. Intentions now are to develop specialty programs in the areas of timber stand improvement, hardwood silviculture, softwood silviculture, urban and community forestry, marketing and industrial development, taxation, harvesting systems, wood energy, Christmas trees, primary processing, wildlife management, pesticides, maple syrup, road construction and soils.

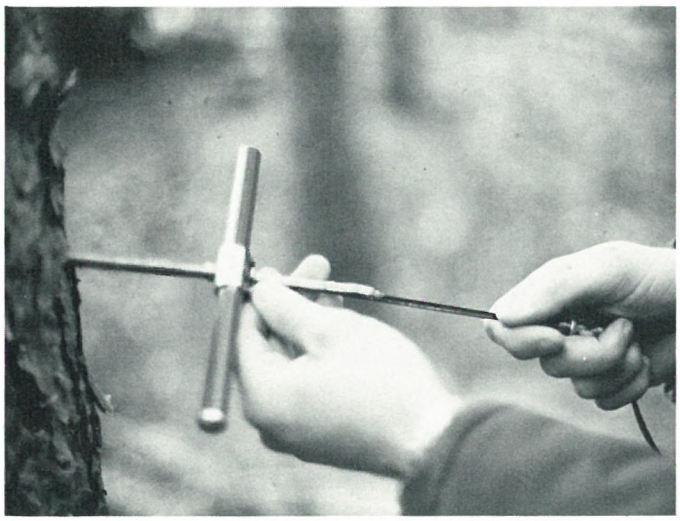
These specialists will be available not only to the landowners, but to the private sector of the forestry community whose full support will be needed to meet the legislative requirements of 12 MRSA §8002.



In addition, program implementation was directed more towards service through other forestry related groups, and increased outreach through information and educational activities. To provide direct assistance, the program now directs foresters to "seek out and motivate landowners in larger (acreage more than 100 acres) size classes to manage their lands and offer self-help training for the landowners in the smaller (acreage) size classes."[31]

Overall, the programs of the Forest Management and Utilization Division now recognize the varied roles of state foresters as:

- Facilitators to insure that woodland mangement opportunities are recognized and addressed by private consulting and industrial foresters.
- Coordinators to integrate the latest technology of logging and milling principles into local operations.
- Educational resource for schools, conservation groups, landowners' associations, communities, extension service, colleges and universities.
- Specialized professional resource for members of the forestry community.
- Environmental protectors in site assessment and educational efforts prior to, during, and after equipment use on forest lands.
- Motivators of landowners, loggers and the private forestry sector.
- Providers of technical assistance where other means are not feasible or available or where special skills are needed.
- Representatives of state government.



Cost Share Programs

Since its beginning, the forest management and utilization program has assisted the Agricultural Stabilization and Conservation Service, of the U.S. Department of Agriculture, in the administration of forestry oriented programs.

One of the current incentive programs is authorized by the Cooperative Forestry Assistance Act (16 USC §2103). This Act established a "forestry incentive program (FIP) to encourage the development, management, and protection of non-industrial private forest lands. The purpose of such program (is) to encourage landowners to apply practices that will provide for afforestation of suitable open lands, reforestation of cut-over or other non-stocked or understocked forest lands, timber stand improvement practices, including thinning, prescribed burning, and other silvicultural treatments, and forest resources management and protection, so as to provide for the production of timber and forest resources associated therewith... Participation in the program is limited to land capable of producing more than 50 cubic feet of commercial timber per acre annually."[32] Landowners may receive, from the federal government, 65 percent of the cost of instituting management practices on at least 10 acres of land.

Funding for FIP originates with the Agricultural Stabilization and Conservation Service (ASCS) of the U.S. Department of Agriculture. This agency also funds a second major cost-share program. In the Agricultural Conservation Program (ACP), the federal government cost shares with the landowner on an at least 65 percent federal — 35 percent private basis for non-commercial activities on forestland.

Before 1983, according to the 1978 USDA Interagency Agreement on Forestry between the Maine Forest Service, Agricultural Stabilization and Conservation Service and Cooperative Extension Service, the Maine Forest Service assisted landowners regardless of their acreage, if a request was made. The current direction of the Maine Forest Service now conflicts with the provision. "Cost per acre for both reconnaissance and follow-up work on lots is relatively inexpensive at a minimum of 10 acres involved in cost sharing. Below this acreage, costs escalate alarmingly."[33] The Maine Forest Service, together with the U.S. Forest Service and other U.S. Department of Agriculture agencies have now begun to resolve the problem so that adequate levels of assistance are provided landowners. Then the agencies can conduct the programs more efficiently and assure the greatest impact on forest management in Maine.

Cost-Share Programs — Cost Effective?

The State's participation in service forestry programs may again change direction. The current concept of cost-share programs is in dispute because of the inability to assess their effectiveness. Supporters argue that non-industrial landowners help to assure a supply of timber, thus keeping prices of timber down. "Lower prices reduce the cost to consumers of goods such as houses and furniture, the environmental pollution associated with use of substitute materials such as steel and plastics, dependence of foreign sources of supply and the rate of use of nonrenewable resources."[34] If incentives are not made available, supporters argue, landowners would not practice forest management. Critics question the practice of offering incentives which impose "no real reciprocal obligation...on the benefitting landowners."[35]

The cost-share provision that timber stand improvement must be non-commercial seems to contradict current economic opportunities. Timber stand improvement activities were once considered financial liabilities. But present uses of trees which are removed during such activities now represent financial credits. Firewood, biomass chips, and pulpwood all may command a price depending on size and location of area. The stipulations and overall philosophy of cost-share programs need to be evaluated to reflect current management practices and marketing opportunities.

Help for the Small Woodland Owner

Other organizations besides the State serve small woodland owners as well. The Management and Utilization Division of the Maine Forest Service works in concert with all of the organizations discussed below.

Begun in 1975, the Small Woodland Owners Association of Maine, Inc. (SWOAM) is a mutual aid organization for owners of private, non-industrial forestland. Offering assistance in such areas as timber inventory, mapping, and business information, the organization seeks to promote sound forest management. SWOAM sponsors field demonstrations, and workshops, and cooperates with State, consulting and industry foresters and the Cooperative Extension Service to promote forestry.

The Cooperative Extension Service, directly affiliated with the University of Maine, is the education arm of the U.S. Department of Agriculture. The Extension Service targets efforts at group audiences rather than a one-on-one approach. Education programs offered by the agency include home horticulture, soils, selection and care of trees, and topics in forestry.

The Soil and Water Conservation Districts and the Soil Conservation Service (SCS) "maintain some flexibility in forestry programs...(as regards) erosion control on forest land."[36] Generally, if there is woodland on farmland, SCS seeks assistance from the Maine Forest Service to initiate management of these acres.

The American Tree Farm Program, spearheaded by the American Forest Institute, honors those who practice good forestry upon their land. A roadside sign is erected to give recognition to these owners. As of 1983, there are approximately 1,600 tree farms scattered throughout Maine, a few are industrial but the vast majority are non-industrial. One and one-half million acres are managed by the non-industrial owners.

The value of the tree farm approach in the Tree Farm Program has led some industries to sponsor tree farm families. Members seek advice from the sponsoring industry in return for a first refusal agreement to sell their wood to the company supplying the forester.

Some lumber and pulp and paper companies have established woodland owner assistance programs. Georgia-Pacific Corporation, International Paper Company, Boise Cascade Corporation, Scott Paper Company, Robbins Lumber Company, Inc., Sprowl Brothers Lumber Company and Hancock Lumber Company are among those who reach out to potential suppliers of wood.

In addition, there are approximately 80 full- and part-time consulting foresters and forestry firms. Often, the Maine Forest Service and SWOAM refer landowners to consultants to continue management assistance which the Maine Forest Service or another entity had begun. However, in some areas, consultants are not as readily available as in others; for example, only five consultants service all of Aroostook County; yet only two of them actually live there.

Research — Another Tool

To further intensify management efforts, more information is required on genetics, tree physiology, tree growth, site characteristics and utilization and marketing, among other topics. All of these are areas in which research is needed.

The research needs of industry, landowners and others must be expressed more effectively to those who conduct research. Likewise, results of research need to be better reported to those who can benefit the most from that research.

The Maine Forest Service has such a role. It continues to become more involved in suggesting areas of needed research to the research community. By then transferring results of research, the agency can provide valuable current information to landowners, industry and field personnel. Research in such areas as spruce budworm has previously been discussed on page 42.

Research will help to point out the increase in profits which may be realized from management practices. The greater the future profit, the more landowners will be convinced of the value of forest management.

The U.S. Forest Service conducts an extensive research program in all aspects of forestry. Forest management, protection and economics are all topics of study. Research goes beyond just the trees and includes wildlife habitat, recreation, soil and water management as well.

The University of Maine conducts several research programs including the Cooperative Forestry Research Unit which concentrates research on intensive management and utilization; and the Forest Products Laboratory which centers efforts on utilization and wood technology. At one time, the University sponsored the Complete Tree Institute which focused on utilization of biomass and the complete tree. The institute promoted use of harvested trees "from the root tips to the leaf or needle tips inclusive with a view to intensive management of a portion of the forest for (1) solid products such as boards and planks (2) reconstituted products such as paper and particleboard (3) solid and liquid fuel (4) food and animal fodder, and (5) fuelstock for the chemical industries."[37]

Other areas of research include wildlife, and forest pathology and entomology. Furthermore, federal support funded through the McIntire-Stennis program is involved in research on a variety of forestry projects.

The Maine State Forest Nursery houses the federally funded Tree Improvement Program (16 USC §2102), part of the Cooperative Forestry Assistance Act. A geneticist researches and promotes insect and disease resistance, rapid growth and local adaptation in tree species. The development and maintenance of provenance tests, progeny tests, seed production areas and seed orchards to obtain superior quality seed for use at the Nursery are all components of the program.

Moved from the University of Maine at Orono to Greenbush in 1956, the Nursery operates under the auspices of the Maine Forest Service. The Nursery also grows seedlings which are used to reforest cutover areas, to convert areas to another species, and to establish plantations. Many seedlings are also distributed at no cost to schools, clubs, and other non-profit groups. Seedlings nurtured in a greenhouse can be grown to proper size for planting in about 1/5 the time it takes for them to grow in the field. In 1983, more than 1,953,000 seedlings were sold.

Although the issue has been addressed in the Legislature, the Nursery is neither directed to nor prohibited from growing Christmas tree stock. The sale of Christmas trees, wreaths, and boughs is an important business in Maine. In 1983, approximately 225,000 Maine Christmas trees were harvested; many were marketed out of state.

Currently, Christmas tree growers cannot easily obtain high quality planting stock. Competition from other states and Canadian provinces has increased. In such instances, the Nursery could supply growers with planting stock and thereby strengthen the Christmas tree industry.

Other Land Owners

Community Forestry

Conduct a program of...community forestry in order to provide advice and assistance on forest management to... municipalities.

12 MRSA §8002

The State Nursery provides seedlings to communities as well as to industry and woodlot owners. In a community, whether urban or rural, trees increase property values. They offer shade from the heat of the summer sun. They muffle noise and break harsh winds. Trees act as a shield from unsightly views. Songbirds and other wildlife share the shelter and food trees provide. Trees beautify a community; trees improve the quality of life.

Some communities recognize the value of trees and the natural landscape in their land use laws. Furthermore, some planning boards and regional planning commissions consider standing trees when they review development proposals. To aid communities, a model set of regulations was developed in 1977 by the State Planning Office, Eastern Mid-Coast Regional Planning Commission and Androscoggin Valley Regional Planning Commission. One of the provisions recommends that proposed subdivision designs "include a landscape plan that will show the preservation of existing trees (10" or more in diameter) and the replacement of trees and vegetation..."[38]

The State enacted the Municipal Subdivision Law (20 MRSA §4956) as minimum standards for developers to follow. The Law calls for development plans to include considerations of possible soil erosion problems and "undue adverse effect on the scenic or natural beauty of the areas, aesthetics, historic sites or rare or irreplaceable natural areas."

Forestry for People

Although development plans may include trees, it must be recognized that not all trees like city life. Winds, dust, direct sunlight, gas and fumes from traffic and industry, and salt spread on roads in winter, all pose hardships.

Therefore, communities should concentrate on species more hardy to these adverse conditions. The Maine Forest Service has a role in providing more information and assistance to communities in care and management of trees and shrubs, in landscape design, and planting. The agency can be of assistance in answering many questions about individual species. For example, will a particular species produce roots that will invade underground pipes, produce leaves that will be a nuisance in the fall, produce fruit that is pungent, produce shade that hinders lawn growth, be overly susceptible to insect and disease attack?

Dedicated in 1982, the Pine Tree State Arboretum in Augusta is managed by the Maine Forest Service. The Arboretum is a tranquil setting for education, recreation and scientific purposes. The display of carefully planted trees and shrubs serves to teach the principles of urban forestry.

Town Forests

Municipal forested land takes the form of town forests, town farms, school forests, and forested land of water districts or reservoir systems. This land is usually administered by conservation commissions or by local recreation committees.

"Eighty-nine communities in Maine have areas designated as town forests. Some communities buy land with specific goals in mind. Others receive gifts or bequests from individuals, corporations, or associations."[39] Still others are benefactors of tax-delinquent properties.

Uses of community forests vary and may include recreation, education and conservation. Few communities employ foresters to see that these lands are managed well. Foresters from the Maine Forest Service can provide technical assistance and advice to communities much the same as to private woodland owners.

The Maine Association of Conservation Commissions and the local town conservation commissions work with communities on environmental concerns such as shade tree planting, land improvement and land acquisition for town forests. For example, the Maine Association of Conservation Commissions, with assistance from the Maine Forest Service and the Maine Municipal Association, has produced a "how to" booklet for municipalities which have established town forests. Legal issues as well as forest management issues are discussed.

State Parks

Those who hike it, fish it, hunt it, camp in it, frequent it, or visit it merely to sit in solitude and wonderment are legitimate spokesmen for it, whether they may be few or many.

— Justice William O. Douglas
405 US 727 Opinion of the Court, 1977

Aesthetics are important on State-owned land as well as private land. The 108 parks and memorials (Table P) entrusted to the Bureau of Parks and Recreation, range in size from one to 22,840 acres. Some are leased to local towns, some to the Department of Inland Fisheries and Wildlife and some to the Maine Appalachian Mountain Club for management; some are undeveloped. Uses vary from site to site, but the vast majority provide visitors with swimming, picnicking, and/or camping opportunities. However, a detailed, long-range management plan exists for only two parks: Bigelow Preserve, managed cooperatively with the Bureau of Public Lands and the Department of Inland Fisheries and Wildlife; and the Allagash Wilderness Waterway.

At least 27 of the State's parks have enough forested land such that proper forest management, including harvesting, could improve the quality of the park. State law forbids cutting of wood for anything but park use. But, clearly, a forest management plan would help assure that the forest was healthy and self-sustaining. Forest management plans can be designed primarily for recreational and aesthetic use and can also include timber harvesting as a secondary goal. The need exists for the Maine Forest Service to work jointly with the Bureau of Parks and Recreation to design forest management plans to establish some parks or portions of parks as demonstration forests. Many park visitors could then experience the results and values of good forest management.

Table P

State Parks and Memorials Administered by Maine Dept. of Conservation, Bureau of Parks and Recreation

PARK/MEMORIAL	LOCATION	ACRES
Allagash Wilderness Waterway	Piscataquis & Aroostook Counties	22,840
Andrews Beach	Portland (Long Is.)	16
Appalachian Trail	Elliotsville Plt.	1,216
Aroostook	Presque Isle	579
Augusta Arboretum	Augusta	16
Bangs Island	Cumberland	55
Battery Gosselin	Castine	1
Beaver Park	Lisbon	338
Bible Point	T3 R3 WELS	27
Bigelow Preserve	T3 R3 BKP WKR	8,472
Birch Point Beach	Owls Head	56
Blueberry Hill	Rome	71
Bradbury Mountain	Pownal	297
Branch Lake	Ellsworth	1,273
Bunganut Pond	Lyman	142
Camden Hills	Camden, Lincolnville	5,470
Carver's Island	Vinalhaven	15
Clark Cove	Harpswell	21
Cobscook Bay	Edmunds Twp.	868
Colburn House	Pittston	7
Cold Stream Beach	Enfield	14
Colonial Pemaquid	Bristol	18
Crescent Beach	Cape Elizabeth	189
Damariscotta Lake	Jefferson	19
Drews Lake	New Limerick	2
Eagle Island	Harpswell	17
Eastern Head	Trescott	263
Farm Island	Moosehead Lake	980
Ferry Beach	Saco	119
Fish River Island	Fort Kent	6
Fort Baldwin	Phippsburg	45
Fort Edgecomb	Edgecomb	3
Fort George	Castine	3
Fort Halifax	Winslow	1
Fort Kent	Fort Kent	8
Fort Knox	Prospect	124
Fort McClary	Kittery	28
Fort O'Brien	Machias	2
Fort Point/Pownal	Stockton Springs	154
Fort Popham	Phippsburg	8
Fort St. George	St. George	3
Fort Webber/Fort Is.	Boothbay	38
Fort William Henry	Bristol	2
Gleason Point	Perry	100
Grafton Notch	Grafton Twp.	3,912
Haystack Mtn.	Castle Hill	215
Hermon Pond	Hermon	24
Holbrook Island	Brooksville	1,230
Jewell Island	Cumberland, Portland	128
John Paul Jones	Kittery	2
Katahdin Iron Works	T6 R9 NWP	18
Kettle Cove	Cape Elizabeth	67
Lake Pennessewassee	Norway	47
Lake St. George	Liberty	354
Lamoine Beach	Lamoine	13
Lamoine	Lamoine	55
Laudholm Farm	Wells	198
Lily Bay	TA2, R13 & 14 WELS	925
Little Chebeague Is.	Cumberland, Portland	86
Little Concord Pond	Woodstock	558
Little Ossippee River	Limington	1,193
Lobster Cove	Boothbay Harbor	10
Long Point	Mt. Vernon, Rome	63
Mere Point	Brunswick	1
Merrymeeting Bay	Bowdoinham	435
Middle Pond	Hiram, Denmark, Sebago	1,888
Montpelier	Thomaston	4
Moose Point	Searsport	147
Mount Blue	Weld	1,289
Mount Waldo	Frankfort	124
Moxie Falls	T1 R5 BKP EKR	217
Nickerson Lake	Linneus, New Limerick	10
Owls Head Light	Owls Head	13
Peacock Beach	Richmond	100
Peaks-Kenny	Dover-Foxcroft	813
Pequawket Pond	Limington	38
Pickering Cove	Deer Isle	106
Pleasant River Lake	Beddington	338
Popham Beach	Phippsburg	555
Quoddy Head	Lubec	532
Range Pond	Poland	753
Reid	Georgetown	771
Rogue Bluffs	Rogue Bluffs	274
Runaround Pond	Durham	144
Sabatis Island	Bridgton	15
Saco River	Brownfield	4
Salmon Falls	Buxton	61
Scarboro Beach	Scarborough	5
Scarboro River	Scarborough	55
Sebago Lake	Casco, Naples	1,338
Shell Heaps	Damariscotta	4
Songo Locks	Naples	1
Spectacle Pond	Vassalboro	251
Squaw Bay	T2 R6 BKP EKR	12
Squaw Mountain	T2 R6 BKP EKR	2,258
Storer Garrison	Wells	1
Sugarloaf Islands N&S	Phippsburg	3
Swans Falls	Fryeburg	47
Swan Lake	Swanville	67
Trout Pond	Stoneham	727
Two Lights	Cape Elizabeth	41
Tyler Pond	Augusta, Manchester	128
Vaughan Woods	South Berwick	165
Warren Island	Islesboro	70
Wilson Island	Wilton	62
Wolf Neck Woods	Freeport	243
Woodbury Pond	Litchfield	17

SOURCE: Department of Conservation, Bureau of Parks and Recreation

Baxter Park

Baxter State Park is an area separate from the state park system. The land was a gift to Maine by Governor Percival Baxter to be "held forever by the state as trustee in trust for the benefit of the people of Maine for state forest, public park and public recreational purposes" (PL 1941 Ch. 95). The Baxter State Park Authority represented by the Director of the Maine Forest Service, the Commissioner of the Department of Inland Fisheries and Wildlife, and the State's Attorney General, direct the management of the park in accordance with a written management plan. Included as part of the gift is an area designated as the Scientific Forest Management Area. Implementation of exemplary forest management practices demonstrates the value of practicing the most modern methods of harvesting, reforestation, and forest protection measures. Wildlife, watershed, recreation and aesthetic considerations must be assimilated within the forest management scheme.

Remote Campsites

In addition to parks in the State, back country hiking and camping experiences are offered through the Maine forest campsite program of the Department of Conservation. Included in the program are ninety remote campsites in northern Maine, currently maintained by the Maine Forest Service. Plans are for the program to be better coordinated with other programs so as to stress both fire prevention and recreational importance. Other similar campsites are maintained by the Allagash Wilderness Waterway and the North Maine Woods.

The Public Domain

Approximately 400,000 additional acres belong to the State as Public Reserved Lands; the Bureau of Public Lands manages these tracts (Table Q). This number includes about 150,000 acres granted to the State in 1981 as settlement in *Charles R. Cushing et al v. State of Maine et al* (Law Docket #Law-81-31 Decision 2719).

When the Bureau was established, the State's land holdings were basically in small scattered lots. This represented a problem in land management. The Bureau set out to consolidate these lots for use by the public. Striving for parcels of at least a township in size (thirty-six square miles), the goal is to have public land fairly well distributed throughout the State with "a natural centerpiece" such as a lake or mountain as a focal point for each parcel.

The Bureau of Public Lands has designed management plans for some of its parcels. The Bigelow Preserve, for example, calls for the greatest attention be given to aesthetic quality. With multiple use — recreation, timber and wildlife habitat — being the philosophy, the Bureau desires that each parcel be a demonstration area, "that will serve as a showcase for forestry statewide."

Table Q

Maine Public Lands Administered by Maine Department of Conservation, Bureau of Public Lands

Region	District	ACRES Management	ACRES Regulated
Eastern	Duck Lake	28,214	26,091
	Haynesville	13,140	11,581
	Rocky Lake	17,580	10,543
	Seboeis	15,549	13,573
		76,403	61,788
Northern	Allagash	37,304	32,935
	Ashland	25,971	23,392
	Scraggly Lake	14,524	13,180
	Square Lake	10,302	9,364
	Telos	37,934	33,605
		126,035	112,476
Western	Bigelow	29,578	19,000
	Dead River	16,906	14,432
	Holeb	33,043	28,592
	Moosehead	30,060	27,334
	Rangeley	34,738	25,542
		144,325	114,900
Southern		3,639	1,482
TOTALS		350,402	290,646

Mangement acres = land under BPL's control; ownership 50-100%.
Regulated acres = land base used in determination of allowable cut.

SOURCE: Bureau of Public Lands, Department of Conservation, March 1984

As part of its land trade strategy, the Bureau of Public Lands has sought acquisition of portions of the Appalachian Trail. With its origin at the peak of Katahdin, the Trail begins its 2,100 mile journey to Georgia. In Maine, the trail is managed cooperatively by the Bureau of Parks and Recreation and the Maine Appalachian Trail Club. Efforts have been devoted to establishing a 600 foot-wide protective corridor along the entire 300-mile Maine stretch of the Trail. In the National Park Service's Comprehensive Plan for the Appalachian Trail, emphasis is upon compatible land uses including agricultural use and limited timber harvesting.

Highways — A Place For Management

The Department of Transportation (DOT) maintains 178 rest areas along major highways throughout the State. Some of these more frequented areas could be used for forest management demonstration areas.

In addition, DOT tends median strips and rights-of-way along the State's roads and highways. In 1982, researchers at the University of Maine conducted a study on the economics of forest management versus current

maintenance activities. Rather than spraying herbicides, mowing, and cutting, the proposal recommended a harvesting cycle which produces chips and/or pulpwood as well as ensuring visibility for traffic.

Thus, many opportunities exist for the State to demonstrate wise forest management upon its own lands. In order to convince private landowners, the State must first be practicing what it is preaching.

Federal Lands

Federal land in Maine is minimal when compared to many other states (Table R). Both Loring Air Force Base in Limestone and Brunswick Naval Air Station manage and selectively harvest their forest land. White Mountain National Park with 48,000 acres of forestland, Acadia National Park with 34,400 acres, and Moosehorn National Wildlife Refuge with 22,666 acres represent the largest federal areas; here aesthetics, recreation and wildlife management are emphasized.

Forest Land Taxation

Taxes — The Inevitable

Land worth a few dollars an acre simply (does) not arouse people's concerns to the same degree as it does when the same land is worth a hundred times as much.

— Henry Vaux
***American Forests* — 1982**

As has been discussed, forested land in Maine is owned by many entities — individuals, non-profit agencies and companies. Uses of the land are diverse. Taxation policies directly influence who will own land and why.

Before 1973, all property in Maine was taxed based upon an "ad valorem" or fair market value philosophy; that is, the tax base was according to the highest and best *economic* use of the property. The tax may or may not have reflected the property's actual use. Local tax assessors set a value upon the local acreage. But this led to much subjectivity as landowners in one locality would receive tax bills reflective of the highest price the land could command, whereas in a neighboring locality with similar land characteristics, the tax rate could be much lower.

More importantly, however, the ad valorem approach called for a tax "levied annually on a crop which ripens only periodically." [40] By its very nature, this approach forced premature cutting. After all, why keep land in trees when taxes upon bare land might be considerably less?

The inequities of such a system upon forested land came under scrutiny. Forested land has a unique characteristic in that "standing timber can be considered as inventory ready for sale, *or* as a factory producing more timber, with the annual growth comparable to reinvested income."[41] The U.S. Forest Service, under the Clarke-McNary Act of 1924 requested that a study be done on forest taxation. The resultant report authored by Fred Fairchild of Yale University entitled **Forestry Taxation in the United States** concluded that a general property tax is inherently biased against any deferred yield investment, such as forestland. Fairchild's conclusions became the cornerstone upon which forest policy in many states developed.

Table R
Federal Land in Maine

FEDERAL AREA	COUNTY	TOTAL ACRES	ADMINISTERED BY
White Mountain National Park	Oxford	48,029	U.S. Forest Service
Acadia National Park	Hancock	34,370	National Park Service
Moosehorn National Wildlife Refuge	Washington	22,666	Fish & Wildlife Service
Massabesic Experimental Forest	York	3,700	U.S. Forest Service
Rachel Carson National Wildlife Refuge	York	2,035	Fish & Wildlife Service
Petit Nanan National Wildlife Refuge	Washington	1,999	Fish & Wildlife Service
Dow Pines Recreation Area	Hancock	375	U.S. Air Force
Carlton Pond National Wildlife Refuge	Waldo	168	Fish & Wildlife Service
Craig Brook National Wildlife Refuge	Knox	136	Fish & Wildlife Service
Seal Island National Wildlife Refuge	Knox	65	Fish & Wildlife Service
St. Croix National Monument	Washington	14	National Park Service
Franklin Island National Wildlife Refuge	Knox	12	Fish & Wildlife Service
Pond Island National Wildlife Refuge	Sagadahoc	10	Fish & Wildlife Service

SOURCE: Department of Conservation, Bureau of Parks and Recreation

Tree Growth Tax

To tax forestlands according to their productivity and thereby encourage their operation on a sustained yield basis.

36 MRSA §571

Convinced of a need to examine forest taxation policies in Maine, the Legislature created the Woodlands Taxation Committee in 1969. The Committe's subsequent report recommended that the ad valorem approach be replaced with a system which recognized productivity. The Tree Growth Tax Law (36 MRSA §571 et seq.), instituted in 1973, was such a system. Its formula estimates the land's annual production of wood, and from this, the current value of the land itself. The formula is:

$$V = \frac{PG\ (1-d)}{r}$$

Where:
V = value per acre by forest type
P = weighted average stumpage price by forest type
G = growth rate by forest type
d = growth rate reduction factor
r = capitalization rate

Under this system, the State Tax Assessor, rather than local tax assessors, determines the necessary values. Other countries which depend heavily upon their forests for economic stability, such as West Germany, Sweden, Finland and parts of Canada, have adopted similar approaches.

One provision of the new tax law places a penalty upon landowners who wish to withdraw their lands from Tree Growth. Conversion of forested land to a use commanding a higher rate of return on investment is thereby discouraged.

Rather quickly, problems with Tree Growth surfaced. Although the law was designed to promote the sustained yield concept, some landowners sought to have their land classified as Tree Growth land even though they had no intention of producing timber.

Amendments in 1981 attempted to correct the snags. Landowners were required to show evidence that the land is being used to grow trees which are to be harvested for commerical use. At present, approximately 95 percent of forested land in the Unorganized Territory is under Tree Growth and 50 percent in the Organized Territory.

A second State law, the Farm and Open Space Tax Law (36 MRSA §1101-18), applies to forested land also. Provisions in this tax law require land to be valued at its current use as farmland or open space rather than its potential value. Woodland may be included in applicable land. The tax rate is the same as in the Tree Growth Tax.

It will come as no surprise that complaints continue to shadow Tree Growth and Farm and Open Space as they do all taxes. The Maine Forest Service will continue to encourage the Legislature to make these taxes as equitable as possible while simultaneously trying to avoid special interest loopholes.

Forest Fire Suppression Tax

New to landowners in the organized towns of the State is a recently enacted (P.L. 1983 C. 556) tax for forest fire protection services. The One Hundred and Eleventh Legislature abolished the Maine Forestry District (page 33) along with its associated tax and extended the principle of payment for forest fire protection services statewide. The tax was assessed for the first time in 1983, on forest ownerships over 100 acres. The Legislature re-examined the issue in 1984 and changed affected acreage to 500 acres, with the first 500 acres being exempt.

Another category of taxation in need of review is federal estate taxation. Presently, those who inherit land must pay approximately 30 percent of the value of the property upon transferance of ownership. For some heirs, the necessity of cutting the trees for income to pay taxes negates any management prescriptions the original owner may have instituted. Although the Maine Forest Service has little if any impact in alleviating estate tax problems, the organization needs to be cognizant of the difficulties those who inherit forest land encounter. This is especially necessary when one of the roadblocks foresters come upon in encouraging forest management is change of ownership.

Education — First and Foremost

The first and most important thing to do is to educate the people up to the importance of preserving our (forest) growth.

— F. L. Harvey
***First Annual Report of the Forest Commissioner,* 1891**

The Maine Forest Service, and all people who care about the forest, face many tasks in ensuring wholesome perpetuation of the forest. The most challenging and ultimately the most far-reaching is to create an understanding of and to instill pride in the natural resources of the State. For owners of forestland, this means pride in ownership and pride in the quality of their forest. For those who work in the woods, this means pride in the quality of their work. For users of the forest, this means leaving the forest in better condition than they found it.

Many organizations work to educate people about the value of the forest. The Cooperative Extension Service and the Soil and Water Conservation Districts and Soil Conservation Service have already been mentioned. Maine Audubon Society provides education to teachers and the general public through publications, field trips, workshops, and establishment of nature sanctuaries. The Natural Resources Council sponsors conferences and workshops to focus on environmental issues. Its members follow legislation, and attend and testify at hearings. The organization conducts information and education programs and sponsors outdoor recreational experiences.

Other programs include Chewonki Foundation's Center for Environmental Education, Hurricane Island Outward-Bound programs, Maine Conservation School at Bryant Pond and others. All stress a greater awareness and understanding of natural resources.

The University of Maine's College of Forest Resources at Orono offers extensive programs of undergraduate, graduate and doctoral forestry study. Their 1,700 acre college forest serves as an outdoor classroom and an opportunity for practical experience. The College is recognized as having one of the best forestry programs in the nation.

Other branches of the university at Ft. Kent and Presque Isle, offer two year forestry programs approved by and in cooperation with the University at Orono. Unity College in Unity includes a two year forestry program in its curriculum offerings.

Vocational programs, both secondary and post-secondary, provide instruction in topics such as wood harvesting, woods equipment use and maintenance, and marking of stands.

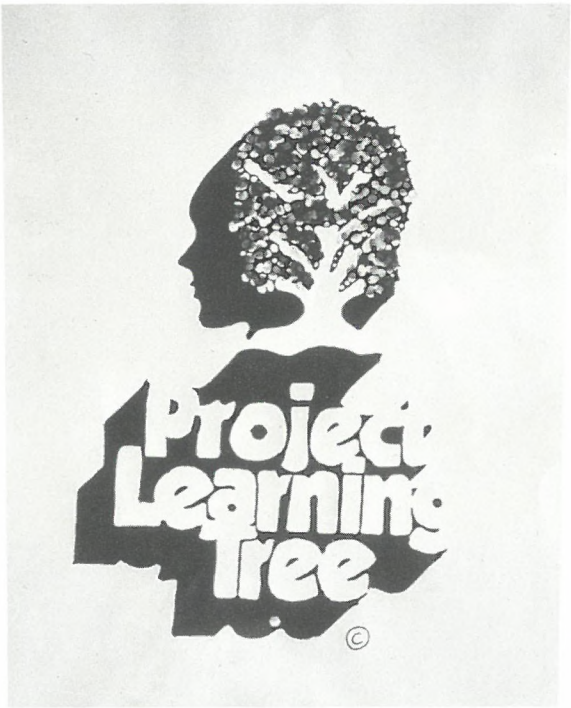
Planting the Seed of Awareness

...gift to each child in the world be a sense of wonder so indestructible that it would last throughout life.

Rachel Carson
***The Sense of Wonder,* 1956**

But the fate of tomorrow's forest lies with today's children. It is in the impressionable years of youth that a respect for and love of the forest has its beginnings.

In 1955, the Legislature mandated the teaching of Maine's history, geography and natural and industrial resources in the State's public schools. The newly completed **Maine Studies** curriculum encompasses all of these topics in a broad K-12 program. It is difficult for indepth study to be given to any particular aspect of Maine studies. However, the curriculum does offer suggestions for further learning.



One approach to teaching about forests is the American Forest Institue's **Project Learning Tree**® . Its major goal is "to provide kindergarten through grade twelve young people with awareness, knowledge, and skills for intelligent and responsible decision-making related to natural resources and human interactions with those resources."[42] The Maine Forest Service began promoting this supplementary program in all elementary and secondary schools in Maine beginning in 1984.

In order to teach children, though, a teacher must first have knowledge of the subject. In "A Survey of Needs Report: Teaching Science Through the Study of the Natural History of Maine," teachers of grades K-6 indicated their need for science activities, teacher background material and science units. They expressed their

greatest need to be for resources and information on *trees*.

The Maine Forest Service will be working with the University of Maine to give teachers the expertise they need in understanding the forest resource. One such course was designed at the University of Maine at Machias. A course objective of the Mobile Graduate Program is to "instill the confidence prerequisite to teaching children about the forest environment, especially outside the classroom, and to consider the economics and issues related to the wise use of forest resources."

A second approach will be to encourage the requirement of courses in Maine's natural history for a degree in education and/or for teacher certification. Currently, aspiring teachers have no such requirement.

The Maine Forest Service is seeking to become more involved in all levels of education. By cooperating with the Department of Educational and Cultural Services, the Maine Forest Service wishes to introduce more information on the forest resource in the State's schools. They will strive to work more closely with teachers. Through suggested field experiences, printed information and classroom visits, teachers will be provided with valuable instructional aids. By sharing learning with students, the Maine Forest Service hopes to create awareness as to how individuals' actions can change the resource. To help a child to understand how a tree grows, how it is interrelated with other living things and why it is essential to the quality of life is the challenge of education.

Courtesy of Kennebec Journal

Identified Needs for Action Related to Forest Utilization and Management

The forest is habitat for wildlife, opportunity for recreation, the origin of quality water and soil, the source of aesthetic experience and the raw material for countless wood products. A balance of uses must exist. Information, education and specialized training and assistance can help citizens to make wise land use decisions and can help to nurture a forest ethic. The following represents needs which have been identified in Chapter Two, Section D. These needs are translated into Actions to be Taken in the **Action Plan** beginning on page 108. The **Action Plan** contains detailed work of the Divisions of the Maine Forest Service. The Actions found in the **Action Plan** may address more than one need as expressed in this section or in other sections of this Chapter.

Needs For Action:

Education

- Provide education to landowners on sound forest management techniques to increase the value of trees, allow for multiple use, and reduce the impact of forest insects, diseases and fires. Conduct education programs which deal with specific topics in forestry for landowners, loggers, and foresters.
- Increase educational efforts for Maine's citizens and their representatives so they understand and appreciate the value of Maine's forests.
- Promote forest education programs for teachers and students in Maine's primary and secondary schools.

Education and Timber Management & Wildlife

- Provide information and assistance to forest landowners on forest management techniques and on markets for wood.
- Establish a statewide network of forest management demonstration areas.

Education, Timber Management & Wildlife, Forest Soils and Watershed

- Provide information and assistance to loggers and woods operators on harvesting techniques which increase forest productivity and, at the same time, protect the environment.

Recreation

- Increase promotional efforts related to use of the forest for recreation.

Recreation and Timber Management & Wildlife

- Coordinate management activities on state-owned land. Maintain forest management demonstration areas on specific sites.
- Encourage and participate in the development of forest management plans which enhance recreational opportunities on lands, both state and private, as appropriate.

Timber Management & Wildlife

- Include specific wildlife considerations in forest management plans.
- Provide special services in various aspects of forestry, such as hardwood silviculture, soils, wildlife habitat, harvesting and primary processing to promote sound forest management and offer expert advice.

Community Forestry

- Conduct an effective State urban and community forestry program which emphasizes the value of trees to the quality of life. Include care and management of shade trees in this program.
- Encourage towns to manage town forests for multiple use.

Forest Economics

- Promote equitable forest land taxation.
- Provide information on the economic returns of sound forest management to landowners.

Forest Economics and Utilization & Marketing

- Expand markets for wood products to stimulate Maine's economy, provide new jobs and expand the tax base. Emphasize value-added products.
- Expand markets for under-utilized species and salvaged trees.
- Provide advice and assistance to primary and secondary wood processors to make production more efficient and profitable.

Utilization & Marketing

- Promote the principle of "highest and best use" of the forest.
- Promote the use of wood, where feasible, as a renewable energy resource.
- Research markets for and encourage the use of under-utilized hardwoods, with particular attention to value-added products.

Planning

- Encourage cooperation among individuals and public and private agencies in forestry programs.
- Analyze and graphically depict forest resurvey data to address specific questions on supply and demand by species; area of State; size, quality and number of trees.

Research

- Encourage research in growing, harvesting and utilizing the forest.

Forest Insect & Disease Management

- Provide information and assistance to forest landowners in managed reforestation of insect or disease destroyed areas.

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CHAPTER THREE

Maine Forest Service Administration

Chapter Three discusses the administration of the Maine Forest Service. The agency is headquartered in Augusta; often field personnel are directly responsible for carrying out programs. This chapter relates the organization and internal needs of the State's forestry agency.

"Mister" he said with a sawdusty sneeze, "I am the Lorax. I speak for the trees. I speak for the trees, for the trees have no tongues."

— Dr. Suess
***The Lorax*, 1971**

The Maine Forest Service is the largest Bureau in the Department of Conservation, representing 66 percent of the Department's budget in 1983 and 61 percent of the Department's FY 84 General Fund budget. Staff size varies from 135 to 485; both the Division of Entomology and the Division of Fire Control rely on seasonal staff, in addition to premanent staff.

Reorganization

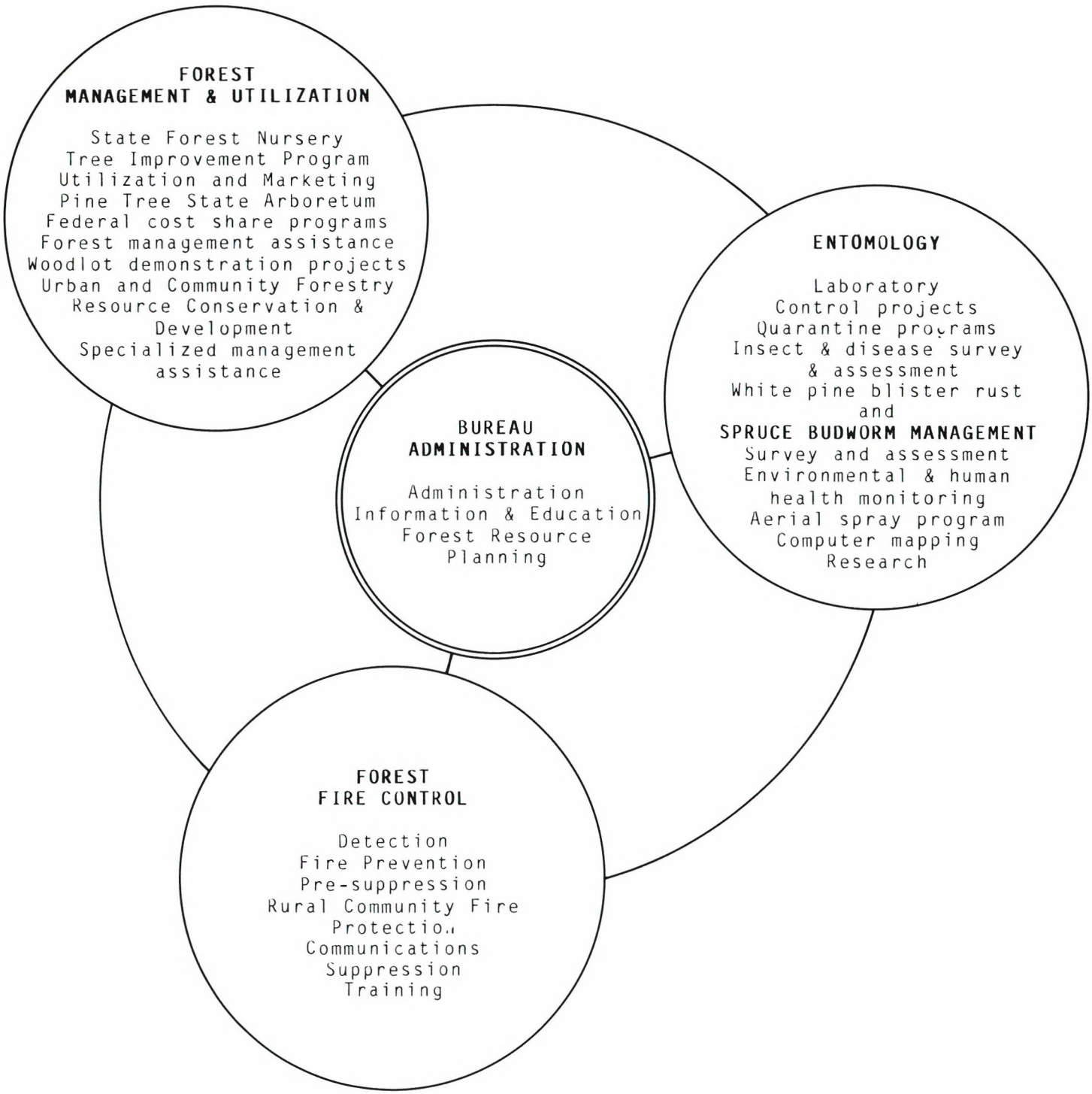
Reorganization of the Bureau, to achieve greater efficiency and best use of staff, is currently underway. This reorganization will also enable the Maine Forest Service to better carry out the activities in the **Action Plan** (pages 108-124). Coincidentally, the new structure is similar to the organization of the U.S. Forest Service, facilitating cooperation between the two agencies. The planned organization is diagrammed in Figure 31. Within the Bureau itself are four divisions: Fire Control, Entomology, Forest Management and Utilization, and Spruce Budworm Management.

The Fire Control Division assumes responsibility for statewide forest fire management activities. The Entomology Division concentrates on forest insect and disease survey and assessment. Currently, a separate Spruce Budworm Management Program conducts the annual spruce budworm project and affiliated programs. Future reorganization plans call for the unit to function with other programs under the direction of the Division of Entomology. The Forest Management and Utilization Division handles all aspects of forest management including planting, growing, harvesting, utilization and marketing of trees and wood products.

Conduct information, education, planning and research programs designed to promote the purposes of the bureau...

12 MRSA §8002

Figure 31
Organization of the Maine Forest Service



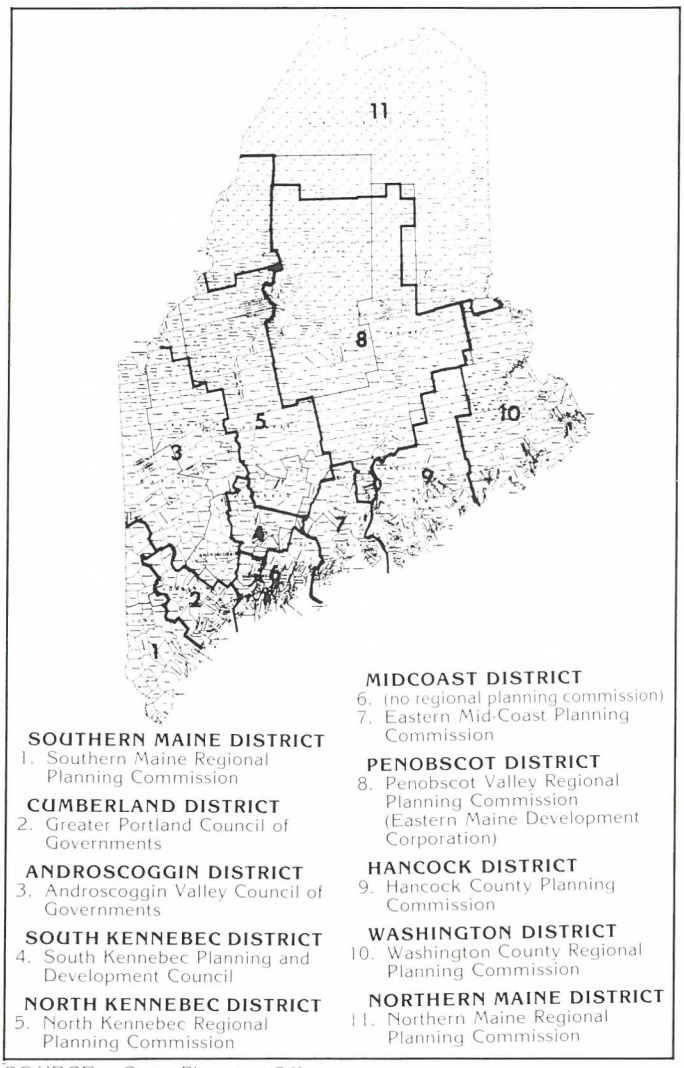
Budgetary and personnel matters, planning, research, information and education responsibilities of the Bureau are included as part of the Office of the Director. Research functions are being defined. They will involve technology transfer and serve to translate the research needs of landowners, industry and field personnel to those who conduct research, and relay results of research back to the practitioners.

All Divisions of the Bureau share a common dependence on information and education efforts. Because the Bureau is a service organization, information and education are crucial in carrying the message of the organization to the public.

The Planning unit of the Maine Forest Service has cooperated with the U.S. Forest Service in the 1982 Resurvey and in developing the forest resource plan. Reorganization molded the unit into the administrative functions of the Bureau. The intent is for the administrative office to become more involved in each Division's annual plans of work and to collect, interpret, and disseminate natural resource data and information to the Divisions. Furthermore, it is important that the administrative office work more closely with the State Planning Office and the State's regional planning commissions (Figure 32).

Organizational changes within the Maine Forest Service are taking place to respond to increasing pressures on the natural resources of the State. Effective organization is vital in times of reduced budget, more exact accountability requirements, and greater demands on human resources.

Figure 32
Planning and Development Districts and Agencies



SOURCE: State Planning Office

Internal Administrative Needs

As the Maine Forest Service has examined the services its provides, internal needs of the Bureau have surfaced. To continue to offer valuable programs, and to begin other necessary programs, the staff must expand their expertise. The agency will begin to assess additional training and educational needs and will inventory the skills and special interests of its staff. The agency is also looking at interdivisional experiences for the staff, so that limited resources can be heightened and staff members can achieve their fullest potential.

Although the programs of the Maine Forest Service have been examined in this plan, it is important that the process continue periodically. Review of programs and activities helps to assure that they are vital and productive.

Realizing the value of current, factual information and data, the Maine Forest Service needs to venture further with the use of computers. All Divisions can increase efficiency by computerizing necessary data and information on timber; markets; landownership; taxation; forest insect, disease and fire hazards; water; soils; and wildlife habitat. Bureau information on equipment and personnel can also be included. This process will aid the Divisions in decision-making about their activities.

As part of improving computer resources, the Maine Forest Service, with cooperation of the U.S. Forest Service, has developed a Geo-based computer mapping system. Its predominant use thus far has been for the spruce budworm suppression program. It has potential for further extensive use within the Bureau, the Department and other departments and agencies. Important aspects of increasing computer use are identifying needs of the Bureau and making Bureau members aware of computer capabilities.

Greater cooperation between agencies is also an area which needs attention. The work of agencies such as the Soil Conservation Service, Cooperative Extension Service, the University of Maine, Maine Association of Conservation Commissions and the Departments of Environmental Protection; Inland Fisheries and Wildlife; Agriculture, Food and Rural Resources; and Educational and Cultural Services all involve forestry activities. Reducing conflicts and duplication, sharing resources, and interchanging information will benefit all agencies involved and ultimately the forest itself.

Identified Needs for Action Related to Administration

Agencies in state government have been created to serve the people of the State of Maine. Effective organization within an agency helps to make it more responsible and accountable.

The following represents needs which have been identified in Chapter Three. These needs are translated into Actions to be Taken in the **Action Plan** beginning on page 108. The **Action Plan** contains detailed work of the Divisions of the Maine Forest Service. The Actions found in the **Action Plan** may address more than one need as expressed in this chapter or other chapters of this plan.

Needs For Action:

Administration

- Provide on-going opportunities for training, education, and professional advancement to Maine Forest Service personnel.
- Periodically review and change programs, if necessary, to assure effectiveness and continued value.
- Expand the use of computers to store and manipulate essential data and information.
- Cooperate with agencies whose responsibilities are forestry-related to avoid duplication and unnecessary costs.

CHAPTER FOUR

Action Plan of the Maine Forest Service

Chapter One of Maine's forest resource plan discussed a history of Maine's forest. Nature's forces together with human actions have shaped the forest of today.

Chapter Two characterized today's forest and the pressures upon it. Challenges paramount to assuring a productive forest were identified and current Maine Forest Service programs were discussed.

Chapter Three explained the organization and administration of the State agency responsible for protection and conservation of the forest resource.

This chapter details the actions the Maine Forest Service is taking or intends to take to assure wholesome perpetuation of the forest.

Development of The Action Plan

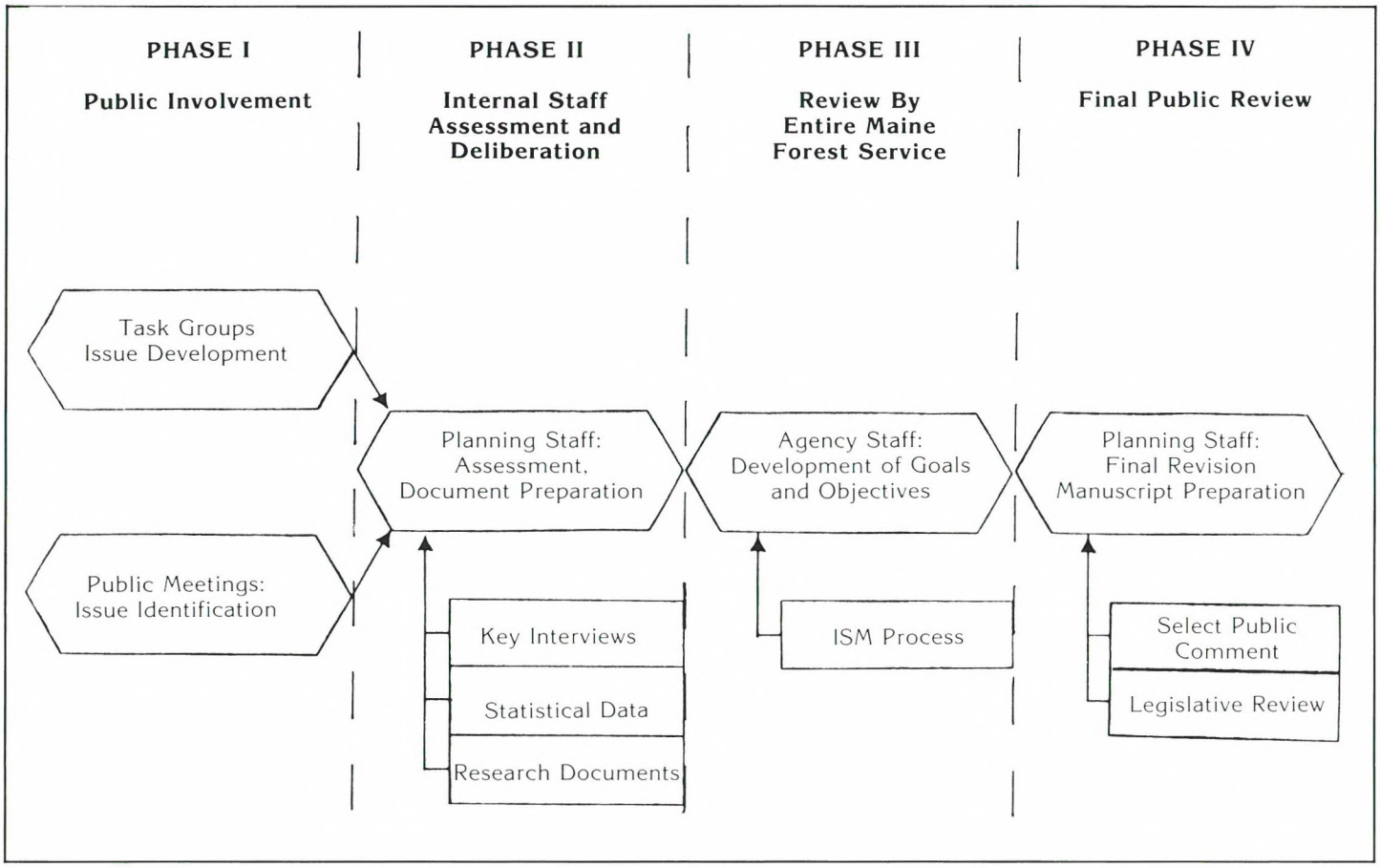
The most important portion of this forest resource plan unfolds below. The **Action Plan** of the Maine Forest Service details the programs and activities of the agency as it responds to the Needs for Action identified in Chapter Two and Chapter Three.

The steps involved in the creation of the **Action Plan** are diagrammed in Figure 33. Development began in 1981; the Task Groups, discussed on page xii, submitted reports on recommendations to meet the needs of the forest resource. The planning unit of the Maine Forest Service sifted through these reports. Some recommendations were appropriate and could be implemented easily by administrative action. Some required a much longer period of time to implement; still others were either inappropriate or were clearly not the agency's responsibility as established in State Statutes pertaining to the Maine Forest Service. The planning staff modified and organized the recommendations into goals and objectives. In the schematic diagram, these steps — public involvement, needs assessment and issue identification — are represented as Phase I.

Over the past several months, many members of the Maine Forest Service participated in designing a preliminary **Action Plan**. During a series of meetings, they added to and revised recommendations presented by the planning unit. Each Division discussed opportunities and targetted Actions which could likely help to achieve identified goals. This second step is represented in the diagram as Phase II.

The Maine Forest Service believes that in order for new programs to succeed, those who actually have responsibility for programs must be committed to this implementation. The next step, Phase III, moved from broad external participation by the public to an internal self-evaluation by Maine Forest Service staff. More than

Figure 33
Planning Process for Forest Resource Plan



one quarter of the agency's staff (over sixty people) met together for a three-part exercise to decide priorities for program components.

Exercise A — Reevaluation of Roles

The first exercise required the participants to respond to the question: "Given the ideal, and disregarding budgetary and staffing limitations, what are the elements of programs the Maine Forest Service should be conducting?"

Such an exercise is conducive to new ideas, encourages contributions from all participants and begins to foster an ownership of the resulting program. Predictably, the responses reflected traditional programs and means for conducting those programs. Some responses, however, sparked interest in ideas which had been discussed for years but had never been developed or implemented; other responses were totally new.

Exercise B — Set Priorities

The second exercise introduced the reality of budgetary constrictions. Staff reacted to the question: "Given limited personnel and financial resources what are the most important programs the Maine Forest Service should be conducting?"

By phrasing the question in such a manner, participants began to appreciate the need for establishing priorities. Furthermore, this type of exercise helped staff to experience greater participation in the functioning of the agency. The results of this exercise revealed that the staff emphasized traditional program elements more than new approaches. Yet the exercise served to establish a framework for building change into programs.

The Director presented to the staff members a comprehensive program direction for each Division; in the **Action Plan**, beginning on page 108, these program directions are highlighted as MISSION STATEMENTS, they represent a union of many goals. The staff were

also given the same list of goals and objectives as in the first exercise. Although priorities had already been discussed, some low priority activities would greatly aid the accomplishment or implementation of activities ranked higher. For this exercise, Maine chose Interpretive Structural Modeling (ISM), developed by the Center for Interactive Management at the University of Virginia. The ISM process demonstrated the interrelationships of various elements of a topic.

In the exercise, participants responded to questions, posed by a computer, which involved ranking activities for maximum accomplishment of objectives. For example, an activity which called for computerizing forest fire data and information was given a low priority by staff members. Yet accomplishing that activity would enable a higher priority activity — that of developing and maintaining human resource capability for forest fire control — to be accomplished faster, more efficiently and possibly with less cost. Completion of the ISM process resulted in a "map" depicting an ordering of activities to achieve maximum benefit.

Four separate "maps" or networks were created each reflective of an overall state forestry agency responsibility — forest fire management, forest insect and disease management, forest resource management and utilization, and agency administration. The maps represented compilations of many of the recommendations of the Task Groups.

For the Maine Forest Service, the maps aided the Director in decisions regarding staff and money. In some cases, the Director will choose to shift staff and funds temporarily to accomplish a seemingly low priority objective in order to achieve a higher priority objective in less time, with fewer staff and less money.

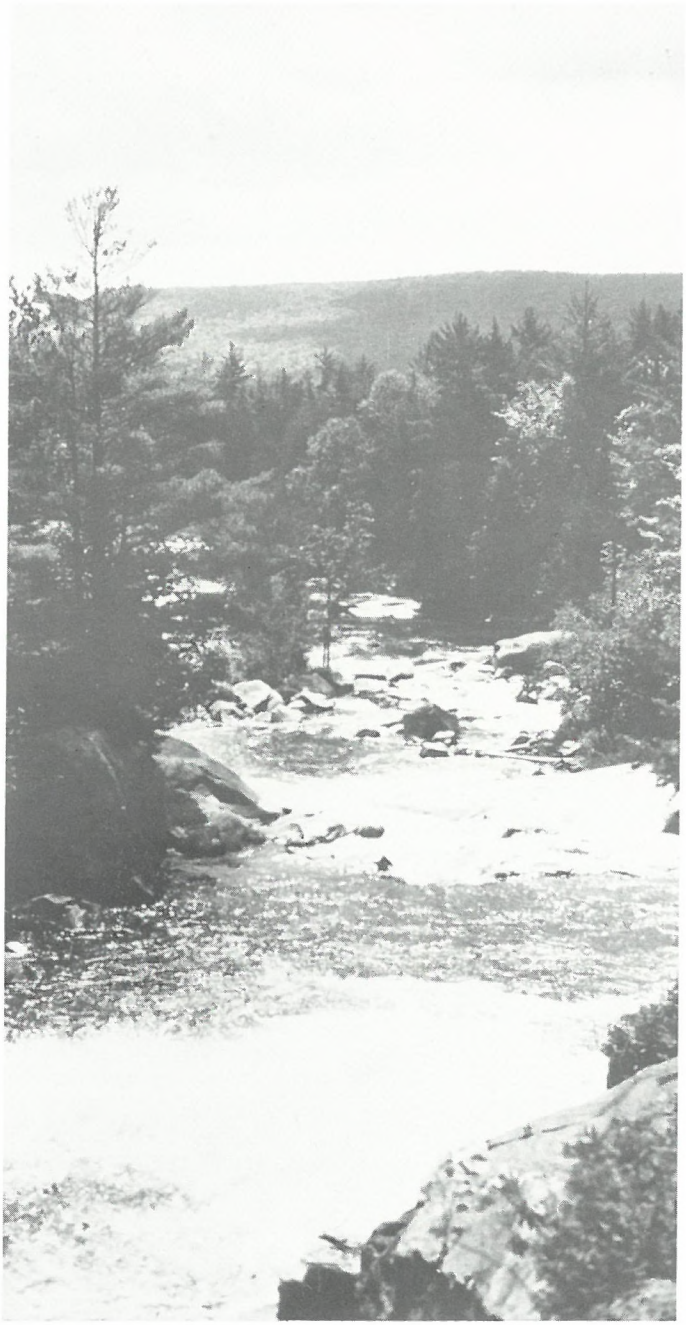
In this manner, the entire *budgetary process* has become an integral facet of the entire *planning process* and vice versa. With a planning-programming-budgeting approach, funding is more justifiable for programs which have survived an evaluation process. When the Director makes requests before the State Legislature and of the federal government, he can justify the requests based upon needs for programs, expected results, and an allocation of people and funds necessary to accomplish stated results.

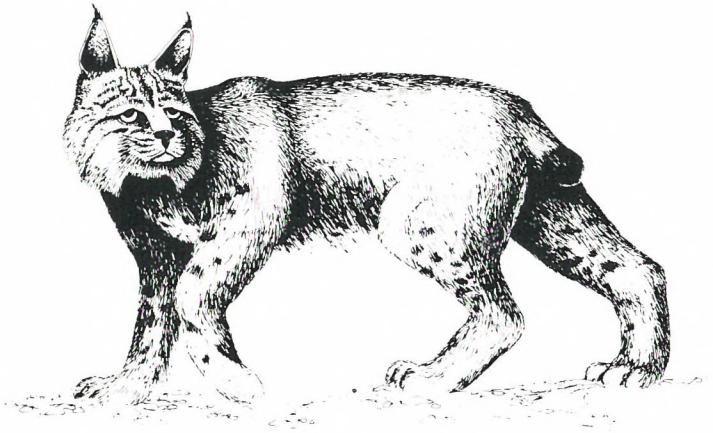
The final step in the planning process is to incorporate the details of the forest resource plan with annual plans of work within each division of the agency. Thus, goals will be translated into a definite work program. The work program will detail not only how and by whom activities are to be accomplished but also why they are to be accomplished. Measuring these accomplishments and comparing the year-end results assure accountability.

As presented in this document, the **Action Plan** presents the MISSIONS and then depicts the CHALLENGES and specific ACTIONS in which the Maine Forest Service will be involved.

The **Action Plan** encompasses responsibilities of all the Divisions of the Maine Forest Service. Although each Division has its own set of primary responsibilities, one important goal is to share responsibilities throughout the organization.

The process of determining directions and programs has involved many members of the Maine Forest Service. They explored many suggestions and alternatives, argued their merits, and with general consensus agreed upon the **Action Plan** as it is presented. The members' participation has been extremely valuable and will be more so as the plan is implemented.





The Action Plan

Thirteen areas of major importance to the Forest have been identified in the introduction of this document. These issues were originally proposed by the Task Groups (page xii) and were modified by the Maine Forest Service. Interrelationships exist between the ISSUES. In its programs, the Maine Forest Service must acknowledge these relationships. Therefore, the ISSUES form the cornerstone upon which the entire **Action Plan** is constructed.

ISSUES:

1. Education
2. Community Forestry
3. Forest Economics
4. Timber Management & Wildlife
5. Soils
6. Insect and Disease Management
7. Forest Fire Management
8. Administration
9. Recreation
10. Planning, Inventory & Data Management
11. Research
12. Watershed Management
13. Marketing and Utilization

The **Action Plan** is divided into four sections, each detailing the program of a Division of the Maine Forest Service. The MISSION STATEMENT of the Division is stated at the beginning of the appropriate section.

Next follows a listing of goals for that Division. The goals are denoted as CHALLENGES. Each CHALLENGE has its roots in the narrative portion of this document. Therefore, the reasons why a challenge is important can be found in Chapter Two and Three and summarized on the pages entitled "Identified Needs for Action" (pages 25, 36, 46, 92 and 102).

Still further in the **Action Plan**, a CHALLENGE consists of many ACTIONS which are specific tasks. Some of the ACTIONS are ongoing; some are new. Some ACTIONS are the primary responsibility of other agencies; some must be shared.

Interrelationships with Annual Work Plans

An important feature of the **Action Plan** is its dependence upon work plans developed annually by each of the Bureau's Divisions. The **Action Plan** has not been designed to stand alone; rather it will guide the agency in decisions as to number of people, types of equipment, amount of time and money necessary to accomplish specific ACTIONS. In this way, the success (or lack thereof) of each ACTION can be evaluated at the end of each fiscal year. Often there will be modifications in a Division's programs to more effectively meet a CHALLENGE and ultimately further the MISSION of that Division of the Maine Forest Service. However, the **Action Plan** together with annual plans of work, will make apparent a total Bureau effort.

Summary of The Action Plan

Much time will pass before all of the ACTIONS and CHALLENGES are met. Some will never be because the forest is changing and the demands and pressures upon it are changing.

The **Action Plan** of the Maine Forest Service then is a beginning . . .

How to Read The Action Plan

Mission Statement — The overriding purpose for the programs of a Division of the Maine Forest Service.

Challenge — A goal which encompasses several activities designed to further a Division's overall mission.

Action — A specific activity recommended to make progress toward meeting a CHALLENGE.

Each CHALLENGE and ACTION are the primary responsibility of the Division whose program is being detailed.

Supporting Divisions and Agencies — Those entities which should work together to accomplish ACTIONS. Supporting Divisions and agencies have secondary responsibilities.

Priority and Target Date — The relative importance the Maine Forest Service places upon the ACTION.

Time when the ACTION is expected to be completed or functioning. The ACTION may already be ongoing.

Some ACTIONS may be of high priority but will take a longer time to accomplish. Other ACTIONS of low priority may need to be accomplished before a higher priority ACTION, so that the higher priority ACTION can be completed more quickly, effectively and/or with less cost.

Issues Affected By Action — One (or more) of the thirteen ISSUES identified as significant to the forest resource.

Evaluation — The criteria upon which an ACTION can be judged successful. In many cases, no numerical value will be attached. The *effectiveness* of the ACTION rather than whether or not it is implemented will be evaluated. Evaluations of ACTIONS will be specified quantitatively in annual work plans.

The **Action Plan** carries the work of the Divisions of the Maine Forest Service to a point. Budgets and annual work plans are the actual implementation.

DIVISION OF FOREST FIRE CONTROL

Mission: **Conduct An Effective Statewide Program of Wildfire Prevention, Detection, Presuppression and Suppression**

CHALLENGE Action	Supporting Division(s) or Agencies	Priority Target Date	Evaluation	Issues Affected by Action
A. Review and Revise Policies of the Fire Control Division				
1. Review and if necessary revise the policy of responding to all forest fires within one hour	Bureau Administration	Medium 1985	a. Completion of review b. Cost effectiveness of responses c. Acceptance by landowners of adequate level of protection	Forest Fire Management Administration
2. Revise the State Fire Plan every five years	Bureau Administration	Medium 1985	a. Completion of review b. Revised plan reflects improved operational capability	Forest Fire Management Planning Administration
3. Review and if necessary revise policy of putting out all fires at any cost	Forest Industries Maine Fire Chiefs Association Bureau Administration	Low 1985	a. Completion of review b. Cost effective responses c. Acceptance by landowners of adequate level of protection	Forest Fire Management Forest Economics Administration
4. Develop a policy for protection of managed timberlands	Division of Forest Management & Utilization Forest Industries Small Woodland Owners Association of Maine Maine Tree Farm Committee	Low 1986	a. Development of policy b. Identification and mapping of managed timberlands c. Minimization of economic loss due to wildfire on these lands	Forest Fire Management Timber Mangement & Wildlife Forest Economics Planning
5. Develop techniques for prescribed burns to be used as a fire prevention and forest management tool	Forest Industries Division of Forest Management & Utilization Bureau of Public Lands Department of Inland Fisheries & Wildlife	Low Ongoing	a. Development of techniques b. Adoption and use of techniques by landowners c. Reduction in amount of forest fire hazard	Timber Mangement & Wildlife Forest Fire Management Watershed Management Soils
B. Improve the Effectiveness of the Fire Control Division				
1. Develop guidelines for proper equipment use and a training program for proper equipment operation	Northeastern Interstate Forest Fire Protection Compact	1986	a. Completion of guidelines b. Usefulness of guidelines in operation of equipment	Administration

2. Computerize present equipment inventory; include maintenance and replacement plans for capital equipment	Bureau Administration Department of Conservation Administrative Services	Medium 1985	a. All equipment information entered into computer b. Timeliness of information provided c. Quality and desired type of information d. Amount and degree of use of system e. Reduction of major repairs and in premature replacing of equipment f. Improvement in budgeting for replacing capital equipment g. Increased efficiency in record keeping	Administration
3. Develop policies on personnel recruitment, assignment and administration	Department of Conservation Administrative Services State Department of Personnel	Medium 1985	a. Completion of policies b. Inclusion of all Fire Control classifications c. Increased level of professionalism by Fire Control personnel	Administration
4. Develop and implement procedures for annual assessment of all Division activities including use and possible expansion of readiness review procedures	Department of Conservation Administrative Services	Medium Ongoing	a. Development of procedures b. Conduct of assessment c. Value to participants of assessment procedure	Administration Forest Fire Management Planning
5. Review fire detection methods for improved technology and their practical applicability in Maine	U.S. Forest Service Forest Industries Maine Fire Chiefs Association Northeastern Interstate Forest Fire Protection Compact	Medium 1986	a. Completion of review b. Cost effectiveness of revised detection methods c. Detection time and response acceptable to landowners	Forest Fire Management
6. Utilize the Maine Forest Service's computerized Geo-based information and mapping system for forest fire data	Bureau Administration Division of Entomology Bureau of Public Lands	Low 1985	a. Information entered b. Timeliness of information provided c. Quality and desired type of information d. Amount and degree of use of system	Forest Fire Management Planning
7. Recognizing how forest pest problems affect forest fire hazards, develop and implement policies and procedures for responding to forest fires in high hazard areas	Division of Entomology Division of Forest Management & Utilization Forest Industries	Low 1985	a. Policies and procedures developed b. Mapping of areas complete c. Improved understanding of relationship of pest damage and fire hazard	Forest Fire Management Timber Management & Wildlife Forest Insect & Disease Management

CHALLENGE Action	Supporting Division(s) or Agencies	Priority Target Date	Evaluation	Issues Affected by Action
C. Increase the Awareness of the Public and Landowners of the need for Forest Fire Protection				
1. Design fire prevention activities aimed at recreational use of the forest	Bureau of Public Lands Bureau of Parks and Recreation North Maine Woods Association Department of Conservation Public Information and Education Division Maine Fire Chiefs Association Forest Industries	Medium 1985	a. Development and distribution of materials and programs b. Increase in requests for materials c. Decline in annual fire losses due to recreational use of the forest	Forest Fire Management Recreation Education
2. Continue to issue permits for campfires and debris burning. Distribute handouts on safe burning techniques when permits are issued	North Maine Woods Association Department of Conservation Public Information and Education Division Forest Industries Maine Fire Chiefs Association Department of Environmental Protection	Medium Ongiong	a. Permits issued b. Handouts developed and distributed with permits c. Decline in wildfire loss due to escaped wildfires or debris burns	Forest Fire Management Education
3. Conduct a vigorous law enforcement program	Bureau Administration Department of Inland Fisheries and Wildlife	Medium 1986	a. Decrease in number of arson-related fires b. Increase in number of of-fenders prosecuted c. Decrease in number of machine-caused fires d. Decrease in number of human-caused fires	Forest Fire Management Administration
4. Establish an educational program for landowners with emphasis on forest fire hazard reduction	Forest Industries Small Woodland Owners Association of Maine Bureau Administration	Medium 1986	a. Program developed b. Acceptance of program by landowners c. Increase in requests for information d. Forest fire hazard reduced	Forest Fire Management Forest Insect & Disease Management Education
5. Expand the Smokey Bear campaign and other public relations efforts. Target efforts to all audiences	Maine Fire Chiefs Association Forest Industries Small Woodland Owners Association of Maine Bureau Administration Department of Conservation Public Information and Education Division U.S. Forest Service	Medium 1985	a. Increase in number of specific activities b. Increase in number of requests for specific activities	Education

6. Revitalize the Maine Forest Service Campsite Program	Bureau of Parks and Recreation Bureau of Public Lands North Maine Woods Association Commissioner of Conservation Forest Industries	Medium 1985	a. Increase in number of staff responsible for program b. Improvement in quality of program c. Increase in use of program by the general public d. Decrease in number of escaped campfires	Recreation Education Forest Fire Management
D. Upgrade and Expand, if Appropriate, Training of Municipal Fire Departments, Local Hot Shot Crews, Industry, Railroad, Vocational School, and College Forest Firefighters 1. Review, and revise as necessary, all fire suppression training programs	Maine Fire Chiefs Association Forest Industries U.S. Forest Service Northeastern Interstate Forest Fire Protection Compact	High Ongoing	a. Completion of review b. Acceptance of recommendations c. Response to program by participants d. Demonstration of improved ability by trained participants	Forest Fire Management Education
2. Conduct training programs in fire prevention, detection, and suppression for municipal fire departments, local hot shot crews, industry, railroad, vocational school, and college forest firefighters	Maine Fire Chiefs Association Forest Industries U.S. Forest Service Northeastern Interstate Forest Fire Protection Compact	High 1985	a. Conduct of programs b. Conduct of Ranger Academy c. Increase in number of participants in program d. Increase in availability of trained people	Forest Fire Management Education

DIVISION OF ENTOMOLOGY

Mission: **Evaluate the Real and Potential Impact of Forest Insects and Diseases. Conduct Actions to Provide Pertinent Data and/or Control of the Problems.**

CHALLENGE Action	Supporting Division(s) or Agencies	Priority Target Date	Evaluation	Issues Affected by Action
A. Sustain, Improve and Expand the Forest Insect and Disease Survey and Detection Role of the Entomology Division 1. Evaluate and modify if necessary the current comprehensive survey and detection program	University of Maine U.S. Forest Service	High Ongoing	a. Survey and detection program modified if necessary b. Survey results used c. Improved ability to anticipate and address pest problems	Forest Insect & Disease Management Timber Management & Wildlife Research Forest Economics Planning
2. Identify needs for specific pest surveys involving both primary and secondary organisms based on present or potential economic values of the resources at stake	University of Maine Forest Industries Small Woodland Owners Association of Maine	High Ongoing	a. Needs identified b. Survey program modified c. Economic factors determined	Forest Economics Timber Management & Wildlife Forest Insect & Disease Management Planning
3. Place increased emphasis on evaluating the degree of damage caused by specific pests. Assemble multi-disciplinary evaluation teams to define criteria which should receive attention during impact studies. Interpret findings and form conclusions	All Divisions U.S. Forest Service University of Maine	Medium 1988	a. Evaluations conducted b. Degree of use of information	All Issues
4. Utilize Maine Forest Service computerized Geo-based information and mapping system for mapping of entomological and pathological conditions	Department of Conservation University of Maine U.S. Forest Service	Medium 1986	a. Information entered into system b. Timeliness of information provided c. Quality and desired type of information d. Amount and degree of use e. Improved efficiency of survey program	Planning Administration Research Forest Insect & Disease Management Timber Management & Wildlife Forest Fire Management

5. Computerize present and past insect and disease survey data concerning pests and host species. Evaluate adequacy of data.	Department of Conservation University of Maine U.S. Forest Service	Low 1986	a. Information entered into system b. Timeliness of information provided c. Quality and desired types of information d. Amount and degree of use of system	Planning Administration Research Forest Insect & Disease Management Timber Management & Wildlife Forest Fire Management
6. Based on Actions 4 and 5 determine requirements for improved survey technology	University of Maine U.S. Forest Service	Low 1986	a. Requirements determined b. Acceptance by entomologists c. Survey technology modified	Timber Management & Wildlife Research Forest Insect & Disease Management
B. Develop, Supervise and Conduct an Integrated Approach to Minimizing the Impact of Forest Pests on the Forest Resources of the State. 1. Define integrated pest management (IPM) in terms applicable to Maine's forest resources	All Divisions	Medium 1985	a. Definition established b. Use of definition	Forest Insect & Disease Management Timber Management & Wildlife Research Education
2. Develop framework from IPM definition to generate IPM strategies		Medium 1985	Framework developed	Planning Timber Management & Wildlife Forest Insect & Disease Management

CHALLENGE Action	Supporting Division(s) or Agencies	Priority Target Date	Evaluation	Issues Affected by Action
3. Develop and recommend integrated pest management strategies	All Divisions Forest Industries Small Woodland Owners Association of Maine Bureau of Public Lands Department of Inland Fisheries and Wildlife Baxter Park Authority	High Target date to be established for specific pests	a. Strategies developed b. Acceptance of recommendations by land managers c. Improvement in forest management plans d. Reduced occurrence of severe and widespread outbreaks of pests	Forest Insect & Disease Management Timber Management & Wildlife Forest Economics Planning Research
4. Recommend integrated pest management strategies on State-owned land	All Divisions Department of Conservation Bureau of Public Lands Bureau of Parks and Recreation Baxter Park Authority Department of Inland Fisheries and Wildlife	Medium 1986	a. Strategies recommended b. Strategies adopted	Timber Management & Wildlife Recreation Forest Insect & Disease Management Watershed Management
5. Evaluate and define a framework to clarify Maine Forest Service response in supervising-coordinating and/or contributing to direct control programs for various pests	Bureau Administration Department of Conservation Forest Industries Small Woodland Owners Association of Maine Maine Audubon Society Natural Resources Council	Medium 1986	a. Evaluation of current response policies of Maine Forest Service completed b. Framework developed c. Acceptance of framework	Timber Management & Wildlife Forest Economics Administration Planning Forest Insect & Disease Management

C. Increase Public Awareness of the Impact of Insects and Diseases on the Forest Resource 1. Evaluate current Maine Forest Service information and education efforts related to forest insects and diseases. Identify needs for revision and expansion of information and education program	Bureau Administration Department of Conservation Public Information and Education Division	Medium 1985	a. Evaluation completed b. Needs identified c. Information and education program revised	Education
2. Implement recommendations of Action 1 above	Bureau Administration Department of Conservation Public Information and Education Division Cooperative Extension Service Small Woodland Owners Association of Maine Resource Conservation and Development Councils Bureau of Parks and Recreation	Medium 1986	a. Development and distribution of materials and programs b. Increased requests for information c. Increase in quality of total program	Education

DIVISION OF FOREST MANAGEMENT AND UTILIZATION

Mission: **In Recognition of the Status of Maine's Important Forest Resource, Conduct a Statewide Forest Management and Utilization Program Which Promotes and Initiates Those Management Practices which will Ensure a Vigorous and Productive Forest. This Program will Maintain the Integrity of Maine's Unique Environment while Enhancing the Economy of the State.**

CHALLENGE Action	Supporting Division(s) or Agencies	Priority Target Date	Evaluation	Issues Affected by Action
A. Increase the Acreage of Forestland Under Active Forest Management				
1. Improve and expand a cooperative state, private and industrial program of professional forestry assistance to small landowners in forest resources management	Maine Tree Farm Committee Small Woodland Owners Association of Maine Forest Industries U.S. Forest Service Agricultural Stabilization and Conservation Service Association of Consulting Foresters	High 1985	a. Increased availability of forest consultants and industrial foresters to expand their role in improvement of the forest resources of the State b. Increased landowner participation in resource management activities	All Issues
2. Continue and expand the tree improvement program at the Maine Forest Nursery	University of Maine — Orono Forest Industries U.S. Forest Service Division of Entomology	High 1985	a. Establishment of seed orchards b. Development of new, improved and insect and disease resistant strains (varieties) of tree species c. Demand for seed and planting stock	Forest Insect & Disease Management Timber Management & Wildlife Community Forestry Research
3. Complete an analysis of the condition of the forest resource and specific silvicultural treatments for intensive forest management	Bureau Administration University of Maine Bureau of Public Lands Forest Industries	1986	a. Completion of analyses of all forest lands in the State b. Dissemination of results to legislators, landowners, industry and general public	Planning
4. Establish a program designed to meet the specific needs identified in Action 3 above	Department of Conservation All Divisions	Medium 1986	a. Support of this program by the public, the forestry community and the Legislature b. Acceptance of analysis by the forestry community and general public	All Issues

5. Implement a technical assistance program for industrial ownerships and consulting foresters to provide leadership, expertise and cooperation in specialized fields of forest management, including wood for energy	Forest Industries Association of Consulting Foresters Cooperative Extension Service Division of Entomology	Medium Ongoing	a. Increased cooperation between state, consulting and industry foresters b. Increased acceptance by forest community of Maine Forest Service expertise in broad resource management areas c. Increased requests for specialized services	Marketing & Utilization Timber Management & Wildlife Recreation Soils Watershed Management
6. In the Division of Forest Management and Utilization, assign specialties to personnel in areas of wildlife management, harvesting, pesticides, taxation, urban and community forestry, harvesting systems, wood energy, Christmas trees, primary processing, economics of woodlot management (including taxation), hardwood silviculture and softwood silviculture	Department of Conservation Administrative Services Bureau Administration	Medium Ongoing	a. Support gained from Department of Conservation and State Department of Personnel b. Percentage of time spent on specialty work c. Number of requests made for additional specialist information and assistance	Administration Timber Management & Wildlife Community Forestry Forest Insect & Disease Management Forest Economics Marketing & Utilization
7. Develop and implement a program to upgrade the training and skills of assigned specialists, and to train and/or hire additional specialists in the following areas: forest hydrology, recreation, tree physiology, marketing and industrial development, and soils	Department of Conservation Administrative Services State Department of Personnel Bureau Administration	Medium 1985	a. Analysis of individual's job performance in regard to task statements b. Percentage of time spent on specialty work c. Support grained from Department of Conservation and State Department of Personnel	Administration Timber Management & Wildlife Recreation Soils Marketing & Utilization Watershed Management
8. Evaluate and promote appropriate changes to present forest land taxation policies	Bureau of Taxation Department of Conservation State Planning Office Forest Industries	Medium 1986	a. Evaluation completed b. Acceptance of changes by landowners c. Increase of forest land under long term management	Forest Economics Timber Management & Wildlife Planning Administration

CHALLENGE Action	Supporting Division(s) or Agencies	Priority Target Date	Evaluation	Issues Affected by Action
9. Utilize Maine Forest Service computerized Geo-based information and mapping system for mapping of forest stand conditions	Department of Conservation University of Maine	Medium Ongoing	a. Information entered b. Timeliness of information provided c. Quality and desired type of information d. Amount and degree of use of system e. Improved efficiency of forest management program	Planning Administration Research Timber Management & Wildlife Forest Fire Management Forest Insect & Disease Management Soils Watershed Management Community Forestry Recreation
10. Establish criteria and design plans for the establishment of forest resource management demonstration areas on both public and private lands statewide	Division of Entomology Bureau of Public Lands Bureau of Parks and Recreation Department of Inland Fisheries and Wildlife Nature Conservancy Maine Audubon Society Maine Tree Farm Committee Cooperative Extension Service State Planning Office Baxter State Park Authority	Low Ongoing	a. Development of criteria and plans b. Acceptance of these criteria and plans by cooperating agencies c. Establishment of demonstration areas d. Number of visitors to demonstration areas e. Requests for information based on the use of these sites	All Issues except Administration
11. Computerize forest resource information	Department of Conservation U.S. Forest Service University of Maine	Low Ongoing	a. Information entered into system b. Timeliness of information provided c. Quality and desired types of information d. Amount and degree of use of system	All Issues

B. Create Recognition by the General Public and the Forestry Community (landowners, loggers, foresters, conservation groups and forest industries) of the Complexity and Interrelationships of the Natural Resources Community 1. Develop and conduct education programs for landowners, loggers, foresters, and wood processors in the areas of: a. wood harvesting, including wood for energy b. road building and erosion control methods c. economic and business management for landowners and loggers d. wildlife habitat management e. forest pathology and entomology	Bureau Administration Land Use Regulation Commission Department of Conservation Public Information and Education Division University of Maine Cooperative Extension Service Department of Inland Fisheries and Wildlife Department of Environmental Protection Small Woodland Owners Association of Maine Resource Conservation and Development Councils Maine Tree Farm Committee Division of Entomology	High 1985	a. Quality of instructional materials and presentations b. Reaction of participants c. Requests for additional information d. Increase in implementing sound harvesting practices e. Decrease in environmental degradation	Planning Timber Management & Wildlife Forest Economics Marketing & Utilization Watershed Management Soil
2. Develop, design, and implement information and education efforts directed toward urban municipalities and landowners on the importance of sound forest resource management of urban land. Include particular emphasis upon recreation, wildlife habitat, aesthetics	Bureau Administration Maine Association of Conservation Commissions Department of Conservation Public Information and Education Division Cooperative Extension Service Regional Planning Commissions	Medium 1985	a. Increased requests for information and/or service b. Increased number of landowners seeking professional forestry services c. Increased number of municipally-owned parcels of forest land under active forest management	Marketing & Utilization Recreation Timber Management & Wildlife Community Forestry
3. Develop educational programs which will motivate non-industrial private forest landowners to practice sound resource management on their holdings	Bureau Administration Department of Conservation Public Information and Education Division Small Woodland Owners Association of Maine Cooperative Extension Service Resource Conservation and Development Councils Maine Audubon Society Maine Tree Farm Committee Society of American Foresters	Low 1985	a. Increased number of requests for professional forester assistance b. Participation in workshops and seminars c. Increased requests for information d. Increased number of tree farms e. Increased number of forested acres under management	Education Timber Management & Wildlife Planning

CHALLENGE Action	Supporting Division(s) or Agencies	Priority Target Date	Evaluation	Issues Affected by Action
C. Develop Tools for Landowners to Analyze their Specific Forest Land Opportunities.				
1. Develop and implement policies designed to bring all State-owned land under long-term management	Department of Conservation Department of Inland Fisheries and Wildlife Bureau of Parks and Recreation Bureau of Public Lands	Medium 1986	Multiple use management plans designed and implemented for all appropriate State land	All Issues
2. Develop computer models for use by forestry practitioners to demonstrate to landowners benefits of sound forest management	Bureau Administration University of Maine U.S. Forest Service	Low 1985	a. Use of these models by state, consulting, and industry foresters b. Acceptance by landowners of the cost of using these models	Forest Economics Timber Management & Wildlife Planning Marketing & Utilization
3. Provide recommendations for reduction of soil erosion and maintenance of water quality in all forest land management plans prepared by the Maine Forest Service	Land Use Regulation Commission Department of Environmental Protection Department of Inland Fisheries and Wildlife	Low 1985	a. Degree to which soil erosion and water quality are addressed in management plans b. Increased awareness by landowners of erosion and water quality	Timber Management & Wildlife Soils Watershed Management Planning
4. Include recognition of non-timber values in forest management plans prepared by the Maine Forest Service	Bureau of Parks and Recreation Department of Inland Fisheries and Wildlife	Low 1985	a. Degree to which non-timber values are addressed in management plans b. Increased awareness by landowners of non-timber values	Timber Management & Wildlife Recreation Soils Watershed Management
D. Strengthen Maine's Forest Resource-Based Economy with Emphasis on the Development of Primary and Secondary Manufacturing Capabilities and the Marketing of Higher Value Wood Products from Maine's Forest Resources				
1. Establish a secondary manufacturing position to provide information and assistance to both existing and potential Maine secondary products manufacturers and funding institutions	Department of Conservation Administrative Services Bureau Administration Finance Authority of Maine	High 1985	Establishment of the position	Marketing & Utilization Forest Economics
2. Utilizing the data management system (see Bureau Administration Challenge A, Action 2) establish a system for determining supply and demand capabilities for presently merchantable species, presently under-utilized species and salvaged wood	Department of Conservation University of Maine	Medium	a. Timeliness of information provided b. Development of new markets c. Demand for information from the system	Marketing & Utilization Planning Timber Management & Wildlife Forest Economics

3. Establish and operate a computerized information clearing-house for both primary and secondary wood products	State Development Office Department of Conservation Cooperative Extension Service	Medium 1985	a. Establishment of system b. Use of system c. Growth of system d. Acceptance by non-state entity for eventual operation of system	Marketing & Utilization Timber Management & Wildlife Forest Economics
4. Encourage and assist the formation of a Maine secondary wood products association	Forest Industries Maine Forest Products Council Maine Hardwood Association Northeastern Lumbermen's Association	Low 1986	Interest shown by secondary wood products manufacturers	Forest Economics Marketing & Utilization Timber Management & Wildlife
5. Encourage the completion of a statewide soil survey	Soil Conservation Service Soil and Water Conservation Commission	Low 1990	a. Completion of survey b. Use of results by landowners and resource planners	Timber Management & Wildlife Planning Soils Watershed Management
6. Continue and expand the program of assisting Maine wood products manufacturers in establishing and/or participating in wood products shows to promote Maine wood products both within and outside of the State	University of Maine Cooperative Extension Service State Development Office	Low 1985	a. Interest shown by manufacturers and/or commodity users b. Attendance by non-industrial public at displays c. Attendance by non-wood products manufacturers and/or community users d. Demand for additional shows	Marketing & Utilization Education Forest Economics
7. Promote the establishment of a large custom dry kiln facility in Maine	Department of Conservation Finance Authority of Maine Resource Conservation and Development Councils	Low 1986	Establishment and prosperity of facility	Marketing & Utilization Forest Economics

BUREAU ADMINISTRATION

Mission: **Support, Coordinate, and Assist the Divisions of the Maine Forest Service in Fulfilling Their Roles to Meet the Needs in the Forest. Promote and Secure the Policies and Programs of the Bureau. Provide Leadership in Educating the General Public as to the Importance of the Forest.**

CHALLENGE Action	Supporting Division(s) or Agencies	Priority Target Date	Evaluation	Issues Affected by Action
A. Increase the Efficiency and Effectiveness of Maine Forest Service Administration 1. Create a position of Deputy Director with the authority to handle routine administrative duties, develop administrative procedures and policies, and coordinate planning, research and information and education activities	Department of Conservation Administrative Services State Department of Personnel	High 1985	Establishment of Position	Administration
2. Maintain and expand the Maine Forest Service data management system. Include timber, wildlife habitat, recreation, water, soil, social and economic information	All Divisions Department of Conservation Administrative Services Central Computer Services University of Maine	High On-going	a. Amount and degree of use of system b. Timeliness of information provided c. Quality and desired type of information d. Increased efficiency in record keeping e. Number of requests for specialized information	Planning Administration All Program Areas
3. Initiate a formal work planning process in all Divisions. Include review of Division activities especially as they are related to the current and future revisions of the forest resource plan	All Divisions Department of Conservation Administrative Services	Medium 1985	a. Implementation of a work planning process b. Compatability of process with the forest resource plan	Administration Planning
4. Develop procedures for equipment use in the Maine Forest Service emphasizing effective shared use as appropriate	All Divisions	Low 1985	a. Complete inventory of equipment b. Degree to which equipment is used by more than one Division	Administration

B. Increase the Awareness of Citizens of Maine and Their Elected Representatives of the Role of Maine's Forest in Maintaining the Economic Health and Environmental Amenities of the State				
1. Create a Maine Forest Service information and education specialist position	Department of Conservation Administrative Services State Department of Personnel	Medium 1986	Establishment of the position	Education
2. Coordinate and/or assist where appropriate the implementation of forestry educational materials and programs in primary, secondary and vocational schools and in teacher-training programs	All Divisions Maine Tree Farm Committee Department of Educational and Cultural Services University of Maine Cooperative Extension Service Department of Conservation Public Information and Education Division Forest Industries Small Woodland Owners Association of Maine	On-going High	a. Increase in number of schools which request information b. Increase in number of schools which request workshops c. Favorable comments from educators as to quality of materials and programs	Education
3. Develop an Information/Education plan of action for raising awareness of the general public and legislators about emerging forestry issues	All Divisions Department of Conservation Public Information and Education Division Maine Audubon Society Resource Conservation and Development Councils Forest Industries Small Woodland Owners Association of Maine Natural Resources Council Maine Tree Farm Committee	Medium 1985	a. Completion of plan b. Degree of implementation of plan c. Response by citizenry and legislators	Education
4. Cooperate with various interest groups in developing and presenting information on the importance of Maine's forest lands to the State's economy and social well-being	All Divisions Department of Conservation Public Information and Education Division Maine Audubon Society Resource Conservation and Development Councils Forest Industries Small Woodland Owners Association of Maine Natural Resources Council Maine Tree Farm Committee	Medium On-going	a. Increase in number of activities conducted jointly b. Degree of willingness to undertake joint ventures c. Degree of acceptance by citizenry and legislators	Education

CHALLENGE Action	Supporting Division(s) or Agencies	Priority Target Date	Evaluation	Issues Affected by Action
C. Prepare Recommendations to the Department of Conservation, Maine Legislature, and the U.S. Forest Service Designed to Stabilize Funding of Maine Forest Service Programs				
1. Establish and implement a system of program budgetary analysis which evaluates program effectiveness	All Divisions Department of Conservation Administrative Services	Low 1986	a. Completeness and acceptability of the analysis b. Usefulness of analysis in suggesting program adjustments	Administration Planning
2. Using the results of Action 1 above and the current forest resource plan, recommend necessary funding levels to the Department of Conservation, the Maine Legislature and the U.S. Forest Service to revise existing programs and to establish new programs as appropriate	All Divisions U.S. Forest Service	High On-going	Response by appropriate funding sources to accept and fund the recommendations	Administration Planning
D. Create a Management System Designed to Maximize the Capabilities and Effectiveness of the Maine Forest Service's Human Resources.				
1. Develop and implement a career development program for Bureau personnel	All Divisions Department of Conservation Administrative Services State Department of Personnel	High 1985	Direct participation of increasing number of personnel in program	Administration
2. Develop policies and procedures to determine individual and Bureau-wide training needs	All Divisions Department of Conservation Administrative Services	Medium 1985	Involvement of an increasing number of personnel in determining these policies and procedures	Administration
3. Implement a Bureau continuing education program to support career development	All Divisions Department of Conservation Administrative Services State Department of Personnel	Medium 1986	a. Number of personnel in courses, seminars, workshops and advanced education, and the number successfully completed b. Quality of inhouse training c. Degree by which new skills are utilized by newly trained personnel in the accomplishment of assigned tasks d. Effectiveness of personnel as indicated by Job Performance Evaluations	Administration

E. Upgrade the Ability of the Maine Forest Service to Respond to Natural Disasters 1. Prepare a disaster action plan including requirements and procedures for damage assessment	All Divisions Civil Emergency Preparedness	Low 1986	Application of provisions of plan to new disaster situations	Administration Timber Management & Wildlife
F. Establish a System for Defining and Communicating Research Needs in Forestry 1. Establish a procedure for defining research needs, submitting these needs to the research community, encouraging the research community to take prompt action, and transmitting research results to the users	All Divisions University of Maine Forestry Resource Research Advisory Committee	Low 1985	a. Procedure established b. Research needs begun to be identified c. Research recommendations submitted to research community d. Follow up on recommendations e. Dissemination of research information	Research Planning

Epilogue

The Maine Forest Service plan has examined all elements of the forest. It has spun threads from history, woven them together with today's forest, and joined both with actions for the future into a tapestry which reflects the dynamic Forest of Maine.

The plan is incomplete. The sequel must offer challenges to other agencies, groups, industries and individuals. It must be an update which can take advantage of more current data and information, such as the 1982 Resurvey.

Although incomplete, the Maine Forest Service plan is both a statement of need and a plan of action. It is a direction for the Maine Forest Service to effectively use personnel and funding to meet the needs in the Forest. It is a guide to the Legislature in establishing funds to adequately address the major issues confronting the forest resource.

It is assurance to the people of the State of Maine that the Maine Forest Service will meets its obligation in protecting and maintaining the Forest for generations to come. It is a pathway for realizing a Quality Forest unparalled in Maine's history.

We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect. There is no other way for land to survive the impact of mechanized man, nor for us to reap from it the aesthetic harvest it is capable, under science of contributing to culture. That land is a community, is the basic concept of ecology, but that land is to be loved and respected, is an extension of ethics.

Aldo Leopold
***A Sand County Almanac*, 1949**

Glossary

Definitions from:

Terminology of Forest Science, Technology, Practice and Products edited by F. C. Ford-Robertson, Society of American Foresters, Washington, D.C. 1971.

*__Handbook for Eastern Timber Harvesting__ by Fred Simmons, U.S. Department of Agriculture — Forest Service, Broomall, Pennsylvania, 1979.

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ad valorem: In property taxation, the tax that is applied as a percent of the assessed value of the property.
alternate host: A second host species without which a parasite cannot complete its life history.
blowdown: Any area on which (many of) the trees have been thrown or broken by the wind.
***board feet:** The amount of timber equivalent to a piece 1 ft. x 1 ft. x 1 in. thick.
***bolt:** Any short stick, generally one between 2 and 8 feet long.
***buck:** To saw felled trees into shorter lengths.
bunch: To skid or otherwise assemble logs together to form a load for subsequent haulage by other equipment.
butt: To saw felled trees into shorter lengths.
chipping: Converted into chips.
clear cutting: The removal of the entire standing crop.
***cord:** A unit of measure of stacked round wood. A standard cord occupies 128 cubic feet of space (usually 4′ x 4′ x 8′).
custom (kiln) drying: Seasoning timber according to a customer's specifications.
defoliation: An untimely reduction in the amount of foliage, due to insect or fungal attack or other agencies.
debark: To remove the bark from a tree or round timber.
edge: The more or less well-defined boundary between two or more elements of the environment.
effluent: The surplus water discharged after use in manufacturing process, with or without the residues of such.
even-aged: Of a forest, crop, or stand, composed of trees having no, or relatively small, difference in age.
***felling:** The process of cutting trees.
fire hazard: A measure of that part of the fire danger contributed by the fuels available for burning.
forest management: Generally the practical application of scientific, economic and social principles to the administration and working of a forest estate for specific objectives.
forest survey: A survey to determine, on a given area, such data as soil conditions and topography, together with the extent, condition, composition, and constitution of the forests, for such purposes as purchase or management or as a basis for forest policies and program.
forest tree improvement: All practices designed to produce genetically more desirable forest trees.
forest utilization: That branch of forestry concerned with the harvesting, any necessary processing, and delivery to the consumer, of forest produce.
great ponds: Naturally occurring bodies of water greater than 30 acres, the shore of which is owned by two or more entities.
growing stock: All the trees growing in a forest or in a specified part of it, generally expressed in terms of number or volume.
hardwood: A conventional term for the timber of broad-leaved trees and the trees themselves belonging to the botanical group Angiospermae.
harvesting: A loose term for the removal of produce from the forest for utilization.
highgrading: A logging operation where only the best trees are cut.
humus: A general term for the more or less decomposed (plant and animal) residues in the soil, litter therefore being excluded.
intensive forestry: The practice of forestry so as to obtain a high level of volume and quality of outturn per unit of area, through the application of the best techniques of silviculture and management.
intermediate cutting: Any removal of trees from a regular crop or stand between the time of its formation and the harvest cutting.
landing: Any place where round timber is assembled for further transport, commonly with a change of method.
litter: The uppermost layer of organic debris on a forest floor.
log drive: A body of round timber loose, in process of being floated down a waterway from forest to mill or chipping point.

patch cutting: A modification of the clear-cutting system...whereby patches of ca. 40 to 200 acres are logged as single settings.
prescribed burning: Controlled application of fire to wildland fuels in either their natural or modified state, under such conditions of weather, fuel moisture, soil moisture, etc., as allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives of silviculture, wildlife management, grazing, fire-hazard reduction, etc.
processing: Submitting a felled tree stem to a succession of conversion operations, typically at a mill but sometimes (e.g. by using harvesters) even before it is removed from its stump.
pruning: Generally, the considered cutting away of superfluous growth (including roots) from any plant, so as to improve its development, fruitfulness, etc.
reforestation: Reestablishment of a tree crop on forest land.
regeneration: The renewal of a tree crop, whether by natural or artificial means.
regeneration cut: Reproduction cutting.
salvage cutting: The exploitation of trees that are dead, dying or deteriorating before their timber becomes worthless.
sawtimber: Trees fit to yield saw logs.
secondary insect: Any insect that can successfully attack only plants that are already weakened, dying, or dead.
seed trees: Removing trees in a mature stand so as to effect permanent opening of its canopy and so provide conditions for securing regeneration from the seed of trees retained for that purpose.
selection cutting: The annual or periodic removal of trees individually or in small groups from an uneven-aged forest in order to realize the yield and establish a new crop of irregular constitution.
shelterwood cutting: Any regeneration cutting in a more or less regular and mature crop designed to establish a new crop under the protection of the old.
silviculture: The theory and practice of controlling the establishment, composition, constitution and growth of forests.
site: An area considered in terms of its environment particularly as this determines the type and quality of the vegetation the area can carry.
skidding: A loose term for hauling logs by sliding...as developed originally from stump to roadside.
slash: The residue left on the ground after felling and tending and/or accumulating there as a result of a storm, fire, girdling, or poisoning.
snag: A standard dead tree from which the leaves and most of the branches have fallen.
softwood: A conventional term for both the timber and the trees belonging to the botanical group Gymnospermae.
stand: A community particularly of trees...possessing sufficient uniformity as regards composition, consitution, age, spatial arrangement, or condition, to be distinguishable from adjacent communities, so forming a silvicultural or mangement entity.
strip cutting: Removal of the crop in strips in one or more operations, generally for encouraging regeneration.
stumpage: Standing timber as viewed by an exploiter.
stumpage value: The value of timber as it stands uncut in terms of an amount per cubic unit.
sustained yield: The yield that a forest can produce continuously at a given intensity of management.
thinning: A felling made in an immature crop or stand in order primarily to accelerate diameter but also, by suitable selection, to improve the average form of the trees that remain, without...permanently breaking the canopy.
timber marking: Selection and indication, generally by a blaze, paint, or marking hammer on the stem of trees to be felled or retained.
timber stand improvement: A loose term comprising all intermediate cuttings made to improve the composition, constitution, and increment of a timber stand.
tree seed orchard: A plantation of trees, assumed or proven genetically to be superior, that has been isolated so as to reduce pollination from genetically inferior outside sources, and intensively managed to improve the genotype and produce frequent, abundant, and easily harvestable seed crops.
***twitch:** To skid logs or tree lengths on the ground without an anti-friction device.
uneven-aged: Of a forest, crop or stand, composed of intermingling trees that differ markedly in age.
value-added: The sale value of output less the cost of input, i.e. comprising essentially the total salaries and wages, rent, depreciation, and profit incurred at any state in the production process.
veneer: A thin sheet of wood of uniform thickness, produced by rotary cutting or by slicing and sometimes by sawing.
water bombing: Dropping water on a forest fire in containers from aircraft in flight.
wood pulp: Wood fibers separated by mechanical or chemical means for use in manufacturing paper, textiles, and many other products derived from cellulose.
yarding: The operation of the initial haul to a collecting point, i.e. of transporting timber from stump to a yard.

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Appendix a

Members and Alternates of the State Forestry Planning Committee

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U.S. Forest Service

Richard Morse
Department of Conservation
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Allen Pease, Director
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Alternate
Joe Chaisson
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Wendall Doty
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Charles Ritzi
Department of Inland Fisheries and Wildlife

Lee Schepps
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Ed Sprague

Elizabeth Swain
Maine Audubon Society

Clayton Totman
Small Woodland Owners Association of Maine
Maine Forest Products Council

R. Leon Williams
Williams Lumber Company

Edward Wood
Soil Conservation Service

Participation on this committee does not necessarily indicate endorsement of this plan.

Appendix b

Task Group Membership — February 11, 1980

CHANGING FOREST LAND USE
Bob Thompson — Androscoggin Valley R.P.C.
Richard Arbour — Maine Forest Service
Eric Root — Greater Portland Council of Governments
Robert Dinneen — Consulting Forester
Dana Douglas — Surveyor/Consultant
Joe Chaisson — State Planning Office
John Gray — P.H. Chadbourne Company
Tyler Libby — District Conservationist (Kennebec)
Larry Long — Assist. State Conservationist

ECONOMICS
David Field — Cooperative Forestry Research Unit, UMO
George Bourassa — Maine Forest Service
Bud Blumenstock — Cooperative Extension Service
Tom Corcoran — University of Maine at Orono
Ken Frye — International Paper Company
Lloyd Irland — Bureau of Public Lands

EDUCATION
Elizabeth Swain — Maine Audubon Society
Marshall Wiebe — Department of Conservation
Lester DeCoster — American Forest Institute
John Labam — P.H. Chadbourne Company
Bud Blumenstock — Cooperative Extension Service
Judy Jalbert — Coastal Enterprises, Inc.
Nancy Cowan — Office of Energy Resources
Ron Locke — Forest Products Marketing & Management Association
Perry Lamb — Small woodlot owner
Hollis Tedford — Time & Tide R.C. & D.
Richard Arbour — Maine Forest Service

FIRE CONTROL
Charles Williams — University of Maine at Orono
Dick Morse — Maine Forest Service
Earle Williams — Maine Forest Service
Bart Harvey — Great Northern Paper Company
Bob Cope — St. Regis Paper Company
Chief Philip McGoulrick — Local fire department
Mel Ames — Maine Woodsmans Association
Bob Hyde — International Paper Company

INSECTS AND DISEASES
Dave Struble — Maine Forest Service
John Dimond — University of Maine at Orono
Eben Osgood — University of Maine at Orono
Richard Campana — University of Maine at Orono
Mark Houseweart — Cooperative Forestry Research Unit, UMO
Roland Perry — Bangor City Forester
Hayward Noyes — Christmas Tree Grower
Jim LaCasce — Small landowner - logger

INVENTORY AND DATA MANAGEMENT
Donna Cassesse — Scott Paper Company
Craig Ten Broeck — Land & Water Resources Council
Jon Ferwerda — Soil Conservation Service
Tom Brann — University of Maine at Orono
Ron Lavaglio — International Paper Company
Joe Chaisson — State Planning Office
Skip House — Great Northern Paper Company
Bud Blumenstock — Cooperative Extension Service
Art Ritter — Department of Inland Fisheries & Wildlife
Terry Keating — J.W. Sewall Company
Roger Greene — Seven Islands Land Company

RECREATION
Tom Dickens — Seven Islands Land Company
Tom Cieslinski — Bureau of Parks & Recreation
Mary Sewall Hamblin — Maine Audubon Society
Floyd Newby — University of Maine at Orono
Joe Kocknavate — Portland Parks & Recreation
Tom Sweetser — Cooperative Extension Service
John DePass — University of Maine at Presque Isle
Frank Farren — Bureau of Parks & Recreation
Dave Field — Appalachian Trail Club
Wallace Jeffrey — B.S.A. High Adventure
Larry Warren — Town of Carrabassett
Richard Jones — Sportsmans Alliance of Maine
Lance Tapley — Cross country skiing
Lowell White — Acadia National Park
Kate Carter — Penobscot Valley R.P.C.
Fern Sterns — Outdoor writer
Ken Spalding — Bureau of Public Lands
Steve Reiling — University of Maine at Orono

RESEARCH
Charles Webb — International Paper Company
Kathy Hale — Maine Forest Service
John Hartranft — Boise Cascade Paper Group
Bart Blum — United States Forest Service
Ed Meadows — Seven Islands Land Company
Tom Rumpf — Maine Forest Service
John Born — Natural Resources Council
Fred Knight — School of Forest Resources, University of Maine
David Rock — New England Forestry Foundation

TIMBER MANAGEMENT
Ron Locke — Forest Products Marketing & Management Association
Jack Dirkman — Maine Forest Service

North Central Sub-Committee:
George Ruopp — Baxter State Park
Phil Andrews — Consultant
Mel Ames — Maine Woodsmens Association, Tree farmer, Consultant
George Ritz — Vocational Forestry Education
Bob Brown — Moosehead Manufacturing
Lyle Chamberlain — Woodex Corporation
Tony Harvish — International Paper Company

South Central Sub-Committee:
Joe Armstrong — Consultant
Gene Putnam — Consultant
Dave Warren — Consultant
Ralph Clifford — Consultant
Bart Blum — United States Forest Service

Southern & Western Sub-Committee:
Earle Bessey — Earle Bessey & Sons
Carroll Gould — Woods Operator
Mike Demo — Consultant
Bob Smith — Consultant
Ripley Swan — Horse logger, Woodland operator
Abbot Ladd — Boise Cascade Paper Group
Duncan Howlett — Small Woodland Owners Association
Dick Arsenault — LaValley Lumber Company
Mike Wayland

WATERSHED MANAGEMENT
Charles Watson — New England River Basins Commission
Lewis Allen — Land Use Regulation Commission
John Born — Natural Resources Council of Maine
Charles Ritzi — Department of Inland Fisheries & Wildlife
Hal Klaiber — Scott Paper Company
Gordon Fraser
Thomas Saviello — International Paper Company
Paul Uttormark — Environmental Studies Center, UMO
Matthew Scott — Department of Environmental Protection
Donald Hoxie — Department of Human Services

WILDLIFE
Terry A. May — Wildlife Resources, University of Maine
Alan Kimball — Maine Forest Service
David Knupp — Unity College
Frank Gramlich — U.S. Fish & Wildlife Service
Douglas Marston — Department of Inland Fisheries & Wildlife
Robert Wengrzynek — U.S. Soil Conservation Service

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